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Influences on Health Related Quality of Life in Community Dwelling Adults Aged 60 Years and Over

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Influence on Health Related Quality of Life in Community Dwelling Adults Aged 60 Years and Over

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

By

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Abstract

INFLUENCES ON HEALTH RELATED QUALITY OF LIFE IN COMMUNITY DWELLING ADULTS AGED 60 YEARS AND OVER

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Interest in patient-reported health care outcomes such as health related quality of life (HRQL) has increased dramatically over the past two decades. Typically, HRQL has been conceptualized as having at least three domains: physical, psychological, and social functioning. Although research has attempted to identify factors that influence HRQL, few studies have simultaneously examined how various factors impact HRQL in the elderly. The purpose of this study was to develop and test a causal model to identify factors influencing HRQL. The constructs and observed variables hypothesized to

influence HRQL included medical burden, housing satisfaction, socioeconomic status, religion/spirituality, age, gender, and marital status.

Three hundred and sixty three (363) participants were drawn from a random sample of community dwelling elderly living in Tompkins County, NY (mean age, 74.9; SD, 8.5; range 60-103). Tompkins County is located in central NY, and home to a large university and mid-size college.

This study was a non-experimental retrospective design using secondary survey data from the "Pathways to Life Quality" study. Using confirmatory factor analysis, a measurement model of HRQL was tested and validated. The final HRQL model was defined by four constructs: general health perception, physical functioning, psychological functioning, and social functioning. Once this model was validated, structural equation modeling was used to test the full model examining factors influencing HRQL. Several goodness-of-fit indices were used to assess model fit. Modification indices were used to provide clues as to what changes would be appropriate to improve model fit. Respecifications to the model were based on theoretical rationale.

Greater levels of medical burden, increased frequency of attendance at religious events, and increased satisfaction with housing significantly influenced HRQL ($p < .001$, $p = .005$, $p < .001$, respectively). Socioeconomic status, age, gender, and marital status did not have a significant effect on HRQL. However, in an a posteriori analysis, greater ease in meeting monthly payments was associated with higher levels of HRQL. Age was indirectly associated with HRQL through its relationship with medical burden. When financial abilities and age were included in the full model, 46% of the variance in HRQL

was explained. Therfore, medical burden, housing satisfaction, religion and financial abilities appear to independently influence HRQL. Other demographic variables including gender, age, and marital status do not have a direct effect on HRQL.

The results of this study suggest that there are other constructs and variables particularly salient and that directly influence HRQL in older community dwelling adults. These variables and constructs should be accounted for when conducting randomized clinical trials and cohort studies examining HRQL outcomes in older adults.

CHAPTER 1

Introduction

Interest in patient-reported health care outcomes has increased dramatically over the past two decades. Jette (1993) suggests three reasons to explain the growth in outcomes research. First, an increasing number of individuals are living with chronic disease, making traditional outcome measures, such as mortality, less meaningful. Second, the demographic characteristics of the population in the United States are changing. Not only has there been a significant rise in the number of elderly individuals, but the number of elderly individuals living with chronic disease has also increased. Lastly, as the cost of health care skyrockets, particularly in the elderly, public and private payers are demanding that health care expenditures be contained. The need for cost containment in the health care of the elderly has pressured health care providers to demonstrate treatment effectiveness by examining patient outcomes. Therefore, researchers have become focused on systematic assessment of outcomes in the elderly.

Historically, the most traditional methods used to measure health outcomes have been through the examination of physiological parameters, mortality, and health service utilization (Kane, 1997). However, it is now recognized that symptom response and mortality rates represent only a narrow range of outcomes, and give little information as to whether the outcome of health care improved an individual's sense of well-being from

a social, psychological and physical perspective (Bowling, 1997). This has resulted in a shift from traditional outcomes to patient-reported outcomes including quality of life (QOL) and health-related quality of life (HRQL) measures. Evidence of this shift is seen not only through the proliferation of QOL and HRQL measures in the health sciences literature (Gill & Feinstein, 1994), but also at the level of the federal government. The Agency for Health Care Research and Quality, the National Institutes of Health, and the Food and Drug Administration all utilize QOL and HRQL measures in their funded research (Kane & Kane, 2000).

Quality of life represents a broad range of human experiences that captures an individual's perception of a variety of factors including standard of living, health, housing and neighborhood, leisure, and marriage (Andrews & Withey, 1976; Campbell, Converse, & Rodgers, 1976; Ware, 2003). Because QOL represents a multitude of broad constructs, the term health-related quality of life (HRQL) is used as a more restricted concept of health. HRQL refers to the experience and importance of different areas of health that are affected by disease or injury and by treatment (Patrick & Erickson, 1993; Ware, 1995). HRQL is consistent with the World Health Organization's (WHO) conceptualization of health which specifies that "health is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity" (World Health Organization, 1958).

While there is an abundance of literature detailing the constructs that make up HRQL, there is considerable variation in the conceptualization and number of constructs captured with each HRQL instrument. McHorney (1996) suggests that current HRQL

instruments may not include constructs that are particularly salient for the older adult population. These include constructs related to housing, and religious and spiritual beliefs. However, few researchers have studied the impact of these and other health and non-health related constructs and variables on HRQL. Therefore, the current study will examine influences on HRQL in the elderly population. These potential influences may need to be accounted for when using HRQL instruments to study health outcomes in the elderly.

Model of HRQL

To examine factors influencing HRQL in the current study, various constructs reported in the literature were used to develop a model of HRQL. Four of the five constructs (i.e.: social functioning [SF], physical functioning [PF], psychological functioning [PsyF], vitality [VT]) were chosen for this model because they are commonly included in HRQL instruments. An additional construct, general health perception (GHP), was chosen as this indicator is among the most commonly used in gerontological HRQL related research (Baron-Epel & Kaplan, 2001; Kaplan & Baron-Epel, 2003).

Background on Constructs and Variables Influencing HRQL

Research suggests that several constructs and variables independent of HRQL may influence HRQL in the elderly (Eshelman, Evans, & Utamura, 2003; Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Kirby, Coleman, & Daley, 2004). Constructs examined in the current study were medical burden, housing satisfaction, religious/spiritual functioning, and socioeconomic status. Single item variables included gender, age, and marital status.

Medical Burden (MB) and HRQL

Most literature to date has studied a single measure of MB and its relationship to a single item measurement of self-appraised health (Cockerham, Sharp, & Wilcox, 1983; Maddox, 1962; Maddox & Douglas, 1973; Palmore & Luikart, 1972). Few studies have examined how MB impacts the multidimensional construct of HRQL. Kane & Kane (2000) suggest that increased levels of MB may have a negative impact on HRQL and serve as an independent variable that predicts general health status in the elderly. Studies that have examined the relationship between a single item measure of MB and HRQL have most frequently used the number of chronic health problems (Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Hellstrom & Hallberg, 2001; Michelson, Bolund, & Brandberg, 2001; Michelson, Bolund, Nilsson, & Brandberg, 2000) . Other measures of MB have included number of medications taken (Esteban, Moraza, Quintana, Aburto, & Capelastegui, 2005; Hershman, Simonoff, Frishman, Paston, & Aronson, 1995), and frequency of utilization of health care resources (e.g.: number of visits to a health care provider, hospital overnight stays) (Ethgen, Kahler, Kong, Reginster, & Wolfe, 2002). While researchers have used a variety of single-item indicators to measure MB, no studies were found that developed a multiple item construct of MB. Multiple measures in combination may provide a more complete representation of the latent variable MB (Quintana & Maxwell, 1999) and offer a better understanding of how MB influences HRQL.

Religious/Spiritual functioning (RSpF) and HRQL

Shi and Singh (2003) report a growing interest in the relationship between health and religious/spiritual well-being. In particular, the religious and spiritual lives of the

elderly is perceived as an important predictor of overall well-being (Olson & Kane, 2000). For example, three-quarters of the population over the age of 65 years rate religion as an important aspect of their lives (Princeton Religious Research Center, 1994).

Most studies have examined the influence of religion and spirituality on components of HRQL; few studies have used validated HRQL instruments. Among those studies looking at the influence of religious and/or spiritual well-being on components of HRQL, findings are inconsistent. For example, in a review by Koenig, McCullough & Larson (2001), 17 studies found that increased levels of religious and spiritual beliefs have a positive impact on psychological well-being (Bergin, 1983; Levin, Chatters, & Taylor, 1995; Levin, Markides, & Ray, 1996), while 7 studies found no relationship between religious and/or spiritual beliefs and psychological well-being. General well-being and physical health are other components of HRQL that have been studied and have demonstrated a positive relationship with religious/spiritual well-being (Levin & Vanderpool, 1987; Maugans, 1996; Powell, Shahabi, & Thoresen, 2003; Seeman, Dubin, & Seeman, 2003).

While there were no studies found examining the relationship between religious and spiritual well-being and HRQL in the community dwelling older adult, there is substantial literature indicating that religious and spiritual beliefs may be positively linked to HRQL (George, Ellison, & Larson, 2002; Levin, 1994; Powell, Shahabi, & Thoresen, 2003; Seeman, Dubin, & Seeman, 2003). However, none of the most commonly used HRQL instruments account for religious or spiritual well-being. It appears that the construct of religion/spirituality is underrepresented in the HRQL

literature. Possible explanations for this under-representation include its perceived lack of importance to researchers, the assumptions that religion and spirituality fall outside the realm of scientific study, and the difficulty in defining and operationalizing the terms (Cohen & Koenig, 2003; Hill & Pargament, 2003).

Housing Satisfaction (HS) and HRQL

Researchers are becoming increasingly interested in the impact of housing satisfaction on HRQL. According to Gitlin (2003), it is estimated that 79% of older adults in the United States live independently in either single family homes or apartments. Housing issues are becoming more relevant for the elderly, as researchers have long recognized that living environments may have a significant impact on the behavior and well-being of older adults (Krout & Wethington, 2003). Additionally, because of the desire to live in one's home for as long as possible, otherwise known as "aging in place", the influence of housing on HRQL in the older adult is particularly relevant.

Although research is limited, there is evidence to suggest that both the neighborhood in which one lives and the physical environment of the housing may affect HRQL. Specifically, problematic neighborhoods and housing arrangements may be detrimental to various aspects of HRQL including physical functioning and psychological well-being (Balfour & Kaplan, 2002; Malmstrom, Sundquist, & Johansson, 1999; Ross, 2000; Ross & Mirowsky, 2001; Steptoe & Feldman, 2001). However, most studies examining the role of neighborhood and housing environment have been limited to young and middle-aged adults (Eshelman, Evans, & Utamura, 2003), and elderly living in

institutional settings (Gitlin, 2003). Little work was found that examined the impact of housing on HRQL in the community dwelling elderly population.

Socioeconomic status (SES) and HRQL

Studies examining the relationship between SES and HRQL support the commonly held belief that individuals with lower SES tend to score poorer on HRQL measures. However, it is not clear whether SES independently influences HRQL, particularly in the older American adult. Further, most studies examining the relationship between SES and HRQL have used a single variable as a proxy for SES. Recent literature suggests that SES should be measured using a multivariate construct to capture the relevant aspects of SES (Braveman et al., 2005).

The most frequently studied SES variable is income level. Both self-rated and actual economic condition have been associated with factors that compromise HRQL such as physical illnesses (negative association), functional health (positive association), self-rated health (positive association), and mental health (positive association) (Berkman & Gurland, 1998; Cheng, Chi, Boey, Ko, & Chou, 2002; Flannelly & Inouye, 2001; Montazeri, Hole, Milroy, McEwen, & Gillis, 2003; Penson et al., 2001). The direct influence money has on options for health care (Lynch & Kaplan, 2000), the effect of income on lifestyle behaviors such as diet and smoking (Graham, 2001), and the psychological and social costs of living in a society with hierarchical classes (Elstad, 1998; Kawachi, 2000) are hypothesized reasons for the association between income and HRQL. Additionally, it has been suggested that income level may not be a suitable proxy for SES in the elderly (Duncan, Daly, McDonough, & Williams, 2002). Several

researchers have recommended using a set of SES measures rather than a single indicator (Braveman et al., 2005; Huisman, Kunst, & Mackenbach, 2003). Therefore, further indicators appear warranted to further elucidate the role of SES on HRQL in the older population.

Other Variables Influencing HRQL

Demographic variables such as age, gender, and marital status have all been shown to influence HRQL. However, similar to SES, it is unclear whether these variables are independent predictors of HRQL. For example, most studies have reported decrements in HRQL as individuals age (Brazier et al., 1992; Hopman et al., 2000; Mishra & Schofield, 1998). However, these studies did not control for confounding variables.

The majority of studies have found that women tend to have decreased levels of HRQL compared to men. However, there is some literature that reports no differences in HRQL between the sexes (Blake, Codd, & O'Meara, 2000; Hopman et al., 2000; Michelson, Bolund, & Brandberg, 2001). In addition, most studies have included a wide age range and therefore it is not clear how gender influences HRQL in individuals aged 60 years and beyond.

Finally, literature has indicated that HRQL is reduced in single older adults compared to married or partnered older adults (Byles, Feldman, & Mishra, 1999; Michelson, Bolund, Nilsson, & Brandberg, 2000). Other research has demonstrated that marital status influences mental functioning but has no effect on physical functioning (Sprangers et al., 2000). To date, the relationship between marital status and HRQL is

inconclusive due to the limited number of studies and the variability in methodology among studies.

Purpose of the Study

While several researchers have attempted to identify influences on HRQL in a variety of patient populations (Douaihy & Singh, 2001; Michelson, Bolund, & Brandberg, 2001), few studies have simultaneously examined how various influences impact HRQL in the elderly (Fry, 2001). In particular, the effects of religious/spiritual functioning, housing satisfaction, SES, and other demographic variables on HRQL are unclear. Literature has suggested that these constructs and variables impact the well-being of the older adult (Kane & Kane, 2000). However, a comprehensive model, looking at causal pathways, and taking into account several important factors related to HRQL has yet to be developed. Therefore, the purpose of this study was to develop and test a causal model to identify influences on HRQL. Specifically, this study addressed the following research question: What are the variables and constructs that influence HRQL in community dwelling adults aged 60 years and over?

Significance of the Study

The literature strongly supports the depiction of HRQL as a multidimensional construct with physical, social and psychological functioning as its core dimensions. However, most instruments are designed for the general population, and not specifically for the elderly. Researchers with a gerontological focus suggest that greater attention be directed to other domains that may be important to the elder adult population (Kane & Kane, 2000). In particular, this study will elucidate the role of several often neglected

constructs and variables that may influence HRQL in the elderly.

The findings of this study add to the literature in two ways. First, the study established those constructs and variables that impact HRQL of older adults. Second, the study determined that these constructs and variables should be accounted for when conducting randomized clinical trials and cohort studies in which HRQL is used as the outcome measurement. The relationship between HRQL and demographics such as age, gender, and marital status are unclear. The inclusion of demographic variables in the proposed model aid in determining whether there is a need to account for these variables when interpreting HRQL in the community dwelling older adult, thereby potentially leading to measurement tools that are more sensitive to the demographic background of this population.

Outline of Subsequent Chapters

Chapter 2 begins with an epidemiological perspective of the elderly and a discussion of health care outcomes. This is followed by a review of models conceptualizing HRQL, and conceptual frameworks examining the relationships between HRQL and outside influences. Lastly, a review of factors influencing HRQL is detailed. Chapter 3 presents the conceptual model used to depict HRQL, along with the full model used to examine factors influencing HRQL. The hypotheses are introduced in this chapter. Chapter 4 begins by detailing the methods used in this study. The HRQL model is validated using confirmatory factor analysis. Descriptive statistics are provided for all variables used, as well as validation of the HRQL measurement model. The measurement models and validation for each of the constructs hypothesized to influence

HRQL are also presented in this chapter. Chapter 5 presents the results of the full structural model, including results of each of the tested hypotheses. Chapter 6 is a detailed discussion of the results, including the major implications of the study, study limitations, and directions for future research.

CHAPTER 2

Review of Literature

The review of literature begins with a discussion of major epidemiological trends in the elderly population. These trends, along with the rise in health care costs, will highlight the importance of studying health outcomes in this growing population of individuals. Next, the difference between patient-reported health outcomes and more traditional outcome measures will be discussed. Following this, HRQL will be defined and several conceptualizations of HRQL will be presented. Next, conceptual frameworks examining how various health and non-health related factors influence HRQL will be discussed. Finally, a review of studies examining the influence of medical burden, housing satisfaction, socioeconomic status, religious/spiritual functioning, and demographic variables on HRQL will be provided.

Epidemiological Perspectives

One of the most dramatic changes in the demographic characteristics of the United States is the growth of the elderly population. Traditionally, the entry point into old age has been considered age 65, as Medicare benefits, retirement, and full Social Security become effective (Shi & Singh, 2003). Accordingly, the elderly population now represents that fastest growing group of individuals in the United States (Pearce, 1998). Population projections made by the United States Census Bureau (2000) predict that by the year 2025, the population 65 years and older will increase by 7%, accounting for

nearly 20% of the total population and representing nearly 63 million people. In this same time period, the population 85 years and older is expected to account for 2% of the total population, representing 7 million people. Although the percentage of individuals 65 and beyond is expected to stabilize through the year 2040, this cohort is expected to grow to nearly 77 million people by the year 2040. In the 85+ group, the percentage is expected to double, representing 14 million individuals.

With increases in life expectancy, more and more elderly individuals are living longer with chronic health conditions and subsequent disabilities. Among adults 65 to 74, nearly 30% reported at least one activity limitation caused by one or more chronic health conditions. In the 75 and over age group, nearly 50% reported at least one activity limitation and 20% reported at least one limitation in instrumental activities of daily living (IADL) (Pastor, Makuc, Reuben, & Xia, 2002). This has resulted in an increased demand on the health care system, particularly on the government funded Medicare program. Currently, it is estimated that individuals 65 and over account for more than 35% of total health care expenditures (Fried, Bradley, Williams, & Tinetti, 2001). In addition, the economic impact of caring for older disabled individuals is estimated at 80 billion dollars annually (Miller, Rejeski, Reboussin, Ten Have, & Ettinger, 2000). These extraordinary numbers have led to concerns about not only the financial solvency of the Medicare program, but also the impact this growing population will have on future health care expenditures.

The demographic shift in the elderly, combined with escalating health care costs for these individuals, has resulted in a tremendous amount of research related to health care delivery and quality of care in the elderly (Kane & Kane, 2000). In order to contain

health care costs, ensure appropriateness of care, provide accountability, and establish effectiveness of treatments, particular importance has been placed on outcome measures.

Health Care Outcomes

Health care outcomes refer to the end result of health care delivery, and are one of the three elements in Donabedian's well-known model used to define health care quality. In his hierarchical model (Figure 1), structure is defined as "the relatively stable characteristics of the providers of care, of the tools and resources they have at their disposal, and of the physical and organizational settings in which they work" (Donabedian, 1980). Examples of structure include facilities, equipment, staffing levels, and staff qualifications. As depicted in Figure 1, structure is an indirect measure of quality of care, and is thought to influence outcomes through its direct relationship to process.

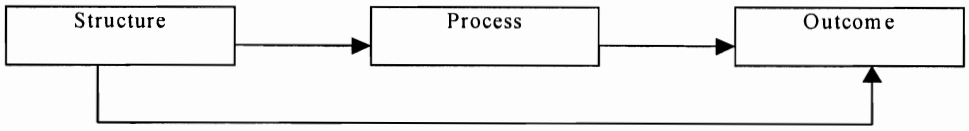


Figure 1: The Donabedian Model (Donabedian, 1980)

Process describes the actual delivery of care, including technical aspects (i.e.: waiting time, correct prescriptions, treatment procedures) and interpersonal aspects (communication, dignity and respect, compassion and concern). It has been defined as "decisions made and actions taken on behalf of the patient by the provider and the providing organization, as well as information exchanged between patient and provider"

(Palmer, Donabedian, Povar, & Institute of Medicine (U.S.), 1991). Process is depicted as mediating the relationship between structure and outcomes.

Donabedian used the term outcomes to refer to "change in a patient's current and future health status that can be attributed to antecedent health care…improvement of social and psychological function in addition to the more usual emphasis on the physical and physiological aspects of performance…patient attitudes (including satisfaction), health-related knowledge acquired by the patient, and health-related behavioral change" (Donabedian, 1980). Outcomes are directly influenced by process and indirectly influenced by structure.

Of the three dimensions used in Donabedian's model, health outcomes are viewed by many as the single most important measure of the effectiveness of health care delivery systems (Shi & Singh, 2003). However, outcome measurements vary considerably. Traditionally, outcomes have reflected more of a physiological component which has included measurements such as clinical signs and symptoms, morbidity and mortality rates, as well as complications such as nosocomial infections, iatrogenic illnesses and rehospitalizations. More recently, however, there has been a growing interest in measuring outcomes that rely on patient-reported information, typically obtained through questionnaires (Kane, 1997). Using patient-reported outcomes allows for measurement of psychosocial dimensions of health from a patients perspective, rather than solely relying on laboratory tests and provider perceptions of patient health. This is particularly important in the elderly, as many of their chronic problems are exacerbated by difficulties in other domains such as psychological and social functioning (Kane & Kane, 2000).

Additionally, measurement of the various dimensions of health, including social and psychological functioning, is in accordance with the most widely accepted definition of health put forth by the World Health Organization (WHO). The WHO defines health as "a complete state of physical, mental, and social well-being, and not merely the absence of disease or infirmity" (World Health Organization, 1948).

The importance of using a broader definition of health, such as that put forth by WHO, is highlighted by various studies that have shown improvements in patient-reported health outcomes, despite lack of improvement in more traditional physiological variables (Jette, 1993). For example, in the rheumatology literature, traditional physiological measurements such as rheumatoid factor, erythrocyte sedimentation rate, and number of inflamed joints have been used to determine treatment effectiveness of rheumatologic interventions. In a longitudinal randomized controlled trial, subjects were either treated in a team approach (n=31) or a non-team approach (n=28). Both physiological variables (C-reactive protein [DRP], Ritchie Articular Index [RQI]) and patient-reported outcome measures (HRQL) were used to determine treatment effectiveness. While no differences were found in CRP or RAI for either group, HRQL was higher in subjects receiving team care, suggesting that improvements in HRQL may not be captured by measuring traditional physiological measurements (Ahlmen, Sullivan, & Bjelle, 1988). Similar findings have been found in the pharmaceutical and pulmonary rehabilitation literature (Jette, 1993), pointing to the need to go beyond traditional physiologic measurements when examining outcomes.

Patient-reported health outcome measures are classified in one of two ways: generic and condition-specific. Generic measures are comprehensive instruments that assess overall health status. They are typically multidimensional and designed to capture physical, psychological and social aspects of health. Instruments that measure multidimensional aspects of health are often said to address quality of life issues (Kane, 1997; Kane & Kane, 2000). Examples of generic measures include the Sickness Impact Profile (SIP), the 36-item Short-Form Health Survey (SF-36), and the Nottingham Health Profile (NHP). In contrast, condition-specific instruments are designed to measure attributes associated with a given condition. Compared to general health status measures, condition-specific measures may be more sensitive in detecting small treatment effects. Therefore, there may be better able to detect clinically meaningful changes (Streiner & Norman, 1995). However, because condition-specific measures have a much narrower focus, they are not useful in comparing results to other similar studies using generic measurements (Kane, 1997). Generally speaking, generic measures exhibit breadth, while condition-specific measures exhibit depth. Examples of condition-specific instruments include the Arthritis Impact Measurement Scales (AIMS), and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

Quality of Life and Health-Related Quality of Life

Definitions

Health related quality of life (HRQL) and quality of life (QOL) are concepts commonly used to evaluate patient-reported health outcomes. They are considered valid clinical indicators of general well-being (McDowell & Newell, 1996), are sensitive to important clinical changes (Wilson & Cleary, 1995) and are used to determine outcomes

of disease management and treatment (Murdaugh, 1997). Despite this rapidly evolving field, there is little consensus regarding the definitions of these terms. Definitions of QOL have varied depending upon the perspective of the researcher. For example, in the social sciences, general health status, functional status, socioeconomic status, life satisfaction, and self esteem are considered the central dimensions of QOL (George & Bearon, 1980). However, in health service research, QOL measures emphasize physical and psychological well-being as well as functional status (Ware, 1995). This latter conceptualization is based on the WHO definition of health (World Health Organization, 1958). Other researchers generalize QOL to include additional aspects of daily existence including standard of living, housing, education, family, friendships, employment, environmental issues and economics (Andrews & Withey, 1976; Bowling & Brazier, 1995; Campbell, Converse, & Rodgers, 1976).

Health researchers have attempted to narrow the definition of QOL in order to focus on health related components of quality of life, hence the term health related quality of life. In general, HRQL is seen as a subset of QOL. However, many health researchers will use the term synonymously. Additionally, considerable variation exists regarding the breadth of HRQL's definition. At one extreme, HRQL has focused on a "within the skin" approach. That is, HRQL includes physical and emotional well-being, but excludes any interaction that takes place "outside the skin", such as social interactions (Feeny, Torrance, & Furlong, 1996). Other researchers have defined HRQL as simply "the impact of health conditions on function" (Kaplan & Anderson, 1996). Broader interpretations include those by Patrick and Erickson (1993) who define HRQL as "the value assigned to the duration of life as modified by impairments, functional states,

perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy". In more recent HRQL literature, most definitions of HRQL take a broad approach and minimally include dimensions of physical, mental, and social functioning. This approach is consistent with a widely used model, the RAND Medical Outcomes Study (MOS), that defines HRQL as "the extent to which health impacts an individual's ability to function and his/her perceived well-being in physical, mental and social domains of life" (Hays, Hahn, & Marshall, 2002). HRQL, commonly thought to be synonymous with general health status (Greenfield & Nelson, 1992; Ware et al., 1995), incorporates multiple constructs, and indicates an individual's own perspective on their health (Andresen & Meyers, 2000).

In the gerontological literature, the distinction between QOL and HRQL is blurred. QOL and HRQL often are used interchangeably when referring to the older adult. Many gerontological researchers reject the restrictive ideas of HRQL and argue for a broader definition (George & Bearon, 1980; Katz & Gurland, 1991). In fact, many researchers contend that not all constructs of HRQL are suitable for all populations (Birren & Dieckmann, 1991; McHorney, 1996). Some authors suggest that HRQL measures in the older adult population should consider the mind, body and spirit, environment, life experiences, life satisfaction, self-esteem, general health and functional status, and socioeconomic conditions (George & Bearon, 1980; Lawton, 1991). However, popular HRQL instruments tools typically do not include these suggested domains. This situation is explained partly by the fact that there are few HRQL instruments designed specifically for the elderly population.

Conceptualization of HRQL

Conceptualization of HRQL as a health outcome depends on the definition of health (Bowling, 1997). The traditional medical model of health defines health as the absence of disease, using mortality as the primary indicator of health (Larson, 1991). Critics of the model argue that impaired health may exist without disease and likewise, disease may exist without compromising good health (Williams, 1983). Additionally, the medical model ignores the impact of psychosocial causes of disease (Larson, 1991).

Clearly, there has been a shift away from measuring health outcomes in terms of survival. Rather than thinking of health in terms of disease and infirmity, the current approach is to conceptualize health and health outcomes relative to the WHO definition of health, emphasizing physical, social, and psychological well-being. The WHO definition has generated a positive, broader concept of health, rather than the negative, disease-based focus emphasized in the medical model (Bowling, 1997).

Several frameworks have been used to conceptualize HRQL. The discussion below focuses on conceptualizations proposed by several social scientists including George Engel, Marilyn Bergner, Donald Patrick, and John Ware.

George Engel Conceptualization: The Biopsychosocial Model

Up until the early 1980's, the "biomedical" model of disease was dominant in medicine (Engel, 1980). This model was used to explain all aspects of health and disease and was considered disease-oriented, rather than patient-oriented. This traditional model excluded patient attributes as well as the psychological and social dimensions of illness. In seminal work in the late 1970's, Engel proposed an alternative model of health and

disease, the "biopsychosocial" model (Engel, 1977). Based on the WHO definition of health, Engel's model laid the foundation for more current conceptualizations of HRQL.

The biopsychosocial model is based on general systems theory (Engel, 1982). Schematically, it is represented as a hierarchy of systems related to health and disease (Figure 2). At the bottom end of the spectrum lie processes at the cellular level (organismic hierarchy). At the top end of the spectrum lie processes at the social level (social hierarchy). The individual person lies at the top of the organismic hierarchy and at the bottom of the social hierarchy. While each system is autonomous, each system also interacts with every other system through feedback mechanisms. Therefore, a health disturbance at one system level is likely to affect other system levels. This framework emphasizes the multiple levels of organization and the possibility of interaction and intervention among various levels.

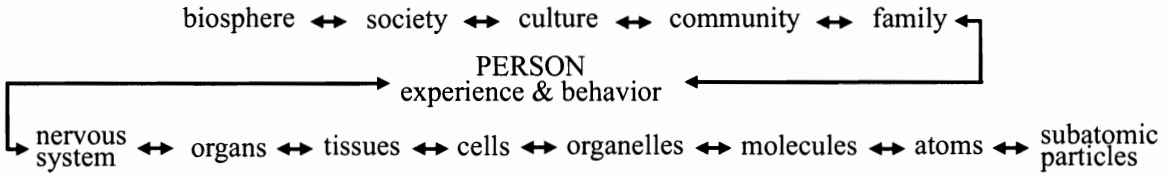


Figure 2: The Biopsychosocial Model of Health and Disease (adapted from Engel, 1980)

Marilyn Bergner Conceptualization: The Sickness Impact Profile (SIP)

In the late 1970's, concurrent with the development of Engel's biopsychosocial model, Bergner developed a model to examine the impact of sickness on behavior dysfunctions (Bergner et al., 1976). The conceptual model is based on the idea that the primary aim of health care is to reduce the amount of sickness and the impact sickness

has on everyday activities, feelings, and attitudes (McDowell & Newell, 1996). A diagrammatic representation of this model is presented in Figure 3.

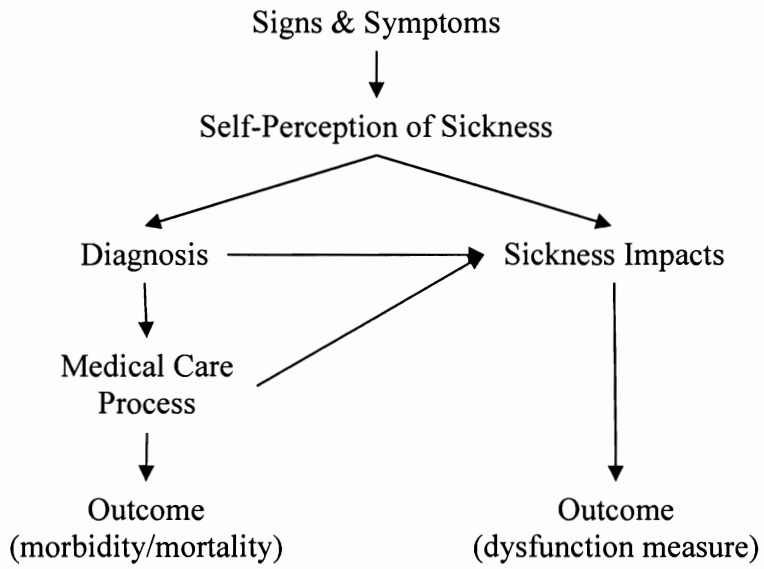


Figure 3: Bergner's Model of Sickness Behavior (adapted from Bergner et al, 1976)

Sickness impacts are conceptualized as "changes in behavior associated with the carrying out of one's daily life activities" (Bergner et al., 1976). Sickness impacts are influenced by signs and symptoms reported by patients and health professionals, the patients' self-perception of their sickness, the actual diagnosis, and the medical process itself. Outcomes of the medical care process refer to morbidity and mortality measures, while outcomes of sickness impacts refer to dysfunction measures.

Bergner's model of sickness behavior led to the development of the Sickness Impact Profile (SIP). The SIP is a generic instrument designed to measure HRQL of an individual by assessing the way sickness changes daily behavior and leads to dysfunction

(McDowell & Newell, 1996). In its final version, the SIP consists of 136 statements divided in 12 categories. The three core dimensions include physical, psychological, and social functioning. A list of the dimensions and categories are depicted in Table 1. The reliability and validity of the SIP is well documented. Test-retest reliability has ranged from .75 to .92 for overall scores (Bergner, Bobbitt, Carter, & Gilson, 1981; de Bruin, de Witte, Stevens, & Diederiks, 1992)

Table 1: The Sickness Impact Profile (adapted from Kane and Kane, 2000)

Dimension	Category	Items describing behavior related to
Independent categories	SR	Sleep and rest
	E	Eating
	W	Work
	HM	Home management
	RP	Recreation and pastimes
Physical	A	Ambulation
	M	Mobility
	BCM	Body care and movement
Psychosocial	SI	Social interaction
	AB	Alertness behavior
	EB	Emotional behavior
	C	Communication

Patrick and Erickson's Conceptualization of HRQL

In an attempt to formulate a conceptualization of HRQL that included more positive aspects of health, Patrick and Erickson (1993) used five constructs to define the scope of HRQL: opportunity, health perceptions, functional status, impairment, and

duration of life. Figure 4 depicts the hypothesized relationships among these HRQL constructs (Patrick and Bergner, 1990). The solid lines represent causal pathways going from disease and injury to opportunity for health. The dotted line represents the possibility that these causal pathways may be reversed. The five constructs are influenced by the environment (e.g.: genetic, personal, social economic, cultural, and physical environment) and result in an improvement, maintenance, or decline in HRQL.

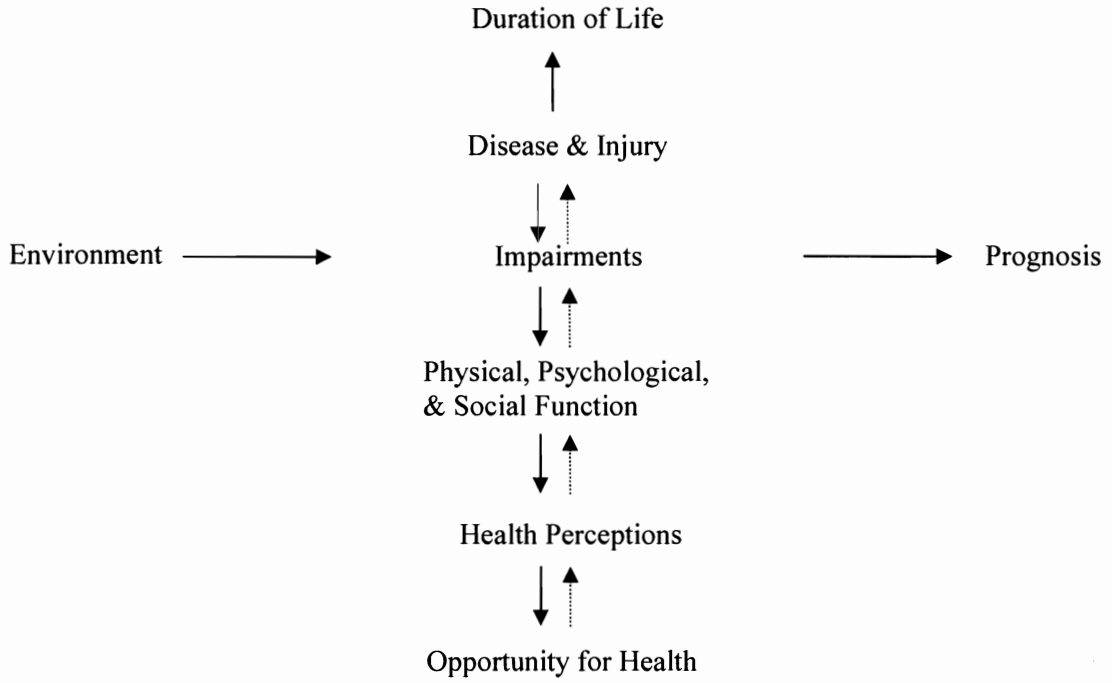


Figure 4: Theoretical Relationships among HRQL Constructs (adapted from Patrick & Erickson, 1993)

Table 2 defines the domains included in each of the constructs related to HRQL. Although Patrick and Erickson's model contains constructs not considered in the SIP, both models view physical, psychological, and social dimensions as core factors in the conceptualization of HRQL.

Table 2: Functional Status Domains of HRQL (adapted from Patrick & Erickson, 1993)

Concepts and domains	Definitions/indicators
Opportunity	
Social or cultural handicap	Disadvantage because of health
Individual Resilience	Capacity for health; ability to withstand stress; reserve
Health Perceptions	
Satisfaction with health	Physical, psychological, social function
General health perceptions	Self-rating of health, health concern/worry
Social function	
Limitations in usual roles	Acute or chronic limitations in usual social roles (major activities) of child, student, worker
Integration	Participation in the community
Contact	Interaction with others
Intimacy and sexual function	Perceived feelings of closeness; sexual activity and/or problems
Psychological function	
Affective	Psychological attitudes and behaviors, including distress and well-being
Cognitive	Alertness; disorientation; problems in reasoning
Physical function	
Activity restrictions	Acute or chronic reduction in physical activity, mobility, self-care, sleep, communication
Fitness	Performance of activity with vigor and without excessive fatigue
Impairment	
Subjective complaints	Reports of physical and psychological symptoms, sensations, pain, health problems or feelings not directly observable
Signs	Physical examination
Self-reported disease	Patient listing of medical conditions or impairments
Physiological measures	Laboratory data, records, and their clinical interpretation
Tissue alteration	Pathological evidence
Diagnoses	Clinical judgments after "all the evidence"
Death and Duration of life	Mortality; survival; longevity

John Ware: The Medical Outcomes Study 36-item Short Form (SF-36)

The SF-36, designed as a generic instrument to measure HRQL, has become one of the most commonly used instruments to study patient-centered health outcomes. Additionally, it is one of the most studied HRQL instruments in the literature. The New England Health Institute estimated that by 1992 over a million forms were being administered each year (McDowell & Newell, 1996).

The SF-36 was originally developed for use in the RAND Medical Outcomes Study which focused on care for chronic medical and psychiatric conditions (Stewart et al., 1989; Tarlov et al., 1989). Items used in the SF-36 have their roots in early health survey instruments used in the 1970's and 1980's, including the General Psychological Well-Being Inventory (GPWBI), various physical and role functioning measures, and the Health Perceptions Questionnaire (HPQ) (Ware, 2004). The original SF-36 was first made available in 1990, and was derived from a 149 item questionnaire called the Functional and Well-Being Profile (FWBP) (Stewart & Ware, 1992). In 1996, version 2 of the SF-36 was introduced.

Conceptually, the SF-36 represents an amalgamation of several health concepts, with its core concepts including physical functioning, psychological functioning, and general health perceptions (Ware & Sherbourne, 1992). Figure 5 illustrates the measurement scales of the SF-36. Theoretically, the SF-36 consists of eight dimensions. Each dimension is measured by multiple items, ranging from 2 to 10 items. The eight dimensions are then aggregated into two summary scales: the Physical Component Scale (PCS) and the Mental Component Scale (MCS). In addition, a single item question is

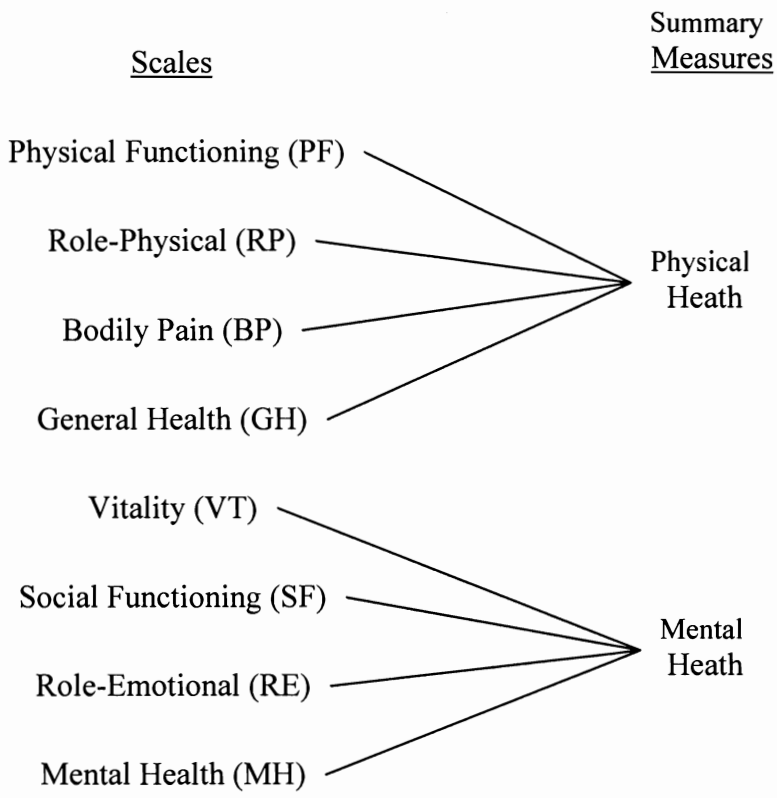


Figure 5: SF-36 Measurement Model (adapted from Ware & Sherbourne, 1992)

included to measure change in health status but is not included in the scoring of the eight dimensions.

Ware's current conceptualization of HRQL distinguishes between a mental component and a physical component. Social aspects of functioning are subsumed under both dimensions. Specifically, role-physical refers to the extent that physical health interferes with work or other daily activities. This aspect of functioning is considered a dimension of the physical health summary measure. Social functioning refers to the degree to which physical or mental health has interfered with social activities. This aspect of functioning is considered a dimension of the mental health summary score.

More recently, Ware has proposed a new conceptualization of HQRL which distinguishes between three principle components of health: physical, mental, and participation (role, social) (Ware, 2003). Ware (2003) offers several reasons for the proposed change. First, the WHO advocates for inclusion of participation as a separately measured domain of health, consistent with the new International Classification of Functioning, Disability, and Health. Second, social and role participation has been considered for decades an integral aspect of HRQL (Ware et al., 1980). Lastly, several countries do not distinguish between physical and mental causes of role limitations (Fukuhara, Ware, Kosinski, Wada, & Gandek, 1998).

The reliability and validity of the SF36 is well documented. Test-retest reliability has ranged from .60 to .80 for the SF36 subscales (Brazier *et al.*, 1992).

Summary of HRQL Conceptualizations

In the late 1970's, a biomedical model of health was proposed by Engel. This model was the first to consider health at both the biological and psychosocial level. This work was followed by several conceptualizations of HRQL, all of which considered physical, psychological and social functioning dimensions of health. To date, one of the most common instruments used to conceptualize and measure HRQL outcomes is the model developed by Ware. This model includes the physical, psychological, and social aspects of health, as well as pain vitality and self-perception of health. The four HRQL conceptualizations presented in this review form the basis of the measurement model used in this study to measure HRQL.

Relationships between HRQL and Outside Influences

Conceptual Frameworks

This section of the literature review begins with a discussion of Nagi's model of disablement, which forms the foundation for several conceptual models examining influences on HRQL. An examination of five conceptual models used to explore factors influencing HRQL follows.

The Relationship between Nagi's Disablement Model and HRQL

In 1965, Saad Nagi developed a theoretical model to clarify the process of disablement and its multiple dimensions (Nagi, 1966). This recursive model described four interrelated constructs: active pathology, impairments, functional limitations and disability (Figure 6).

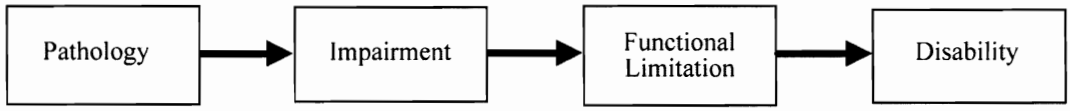


Figure 6: The Process of Disablement (adapted from Nagi, 1965)

According to this model, the main disease pathway progresses in consecutively linked events from active pathology to disability. Active pathologies are conditions involving "interruption of or interference with normal processes and the simultaneous efforts of the organism to regain a normal state". Examples include pathologies due to trauma (fractured femur), metabolic imbalances (diabetes), and degenerative disease processes (arthritis). Impairments are described as a "loss or abnormality of an anatomical, physiological, mental, or emotional nature". This includes impairments related to the current pathology, residual impairments resulting from the pathology even

after the pathology is no longer present, and abnormalities not related to the pathology. Examples of impairments include decreased strength and decreased range of motion. Functional limitations refer to "manifestations at the level of the organism as a whole". Examples include the inability to reach overhead or lift a heavy weight. In this model, functional limitations are considered a mediator between impairments and disability. Finally, disability refers to an inability or limitation in performing socially defined roles and tasks expected of an individual within a sociocultural and physical environment. Examples include self-care, family roles and work roles as well as leisurely pursuits (Tarlov & Pope, 1991).

Several modifications of Nagi's model have been proposed. Once such modification considers the concept of quality of life as an overlapping dimension in the disablement process (Jette, 1994). As depicted in Figure 7, quality of life overlaps the dimensions of functional limitation and disability. In contrast, disability may be seen as a precursor to quality of life outcomes (Figure 8), and therefore is depicted to the right of disability (Verbrugge & Jette, 1994).

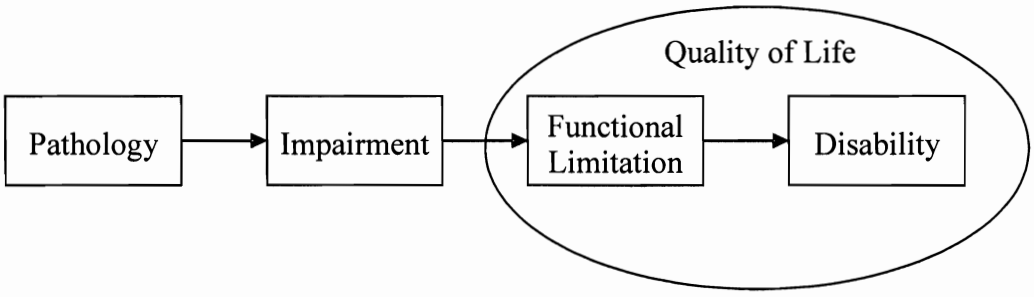


Figure 7: Relationship Between Quality of Life and the Disablement Concepts (adapted from Jette, 1994)

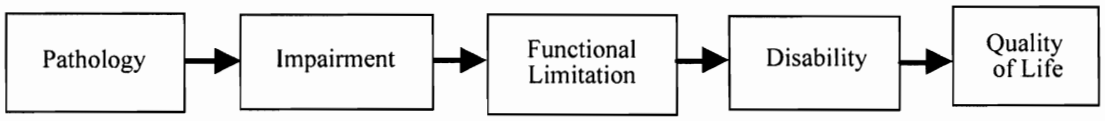


Figure 8: Relationship Between Quality of Life and the Disablement Concepts (adapted from Verbrugge & Jette, 1994)

Verbrugge and Jette Model: The Disablement Process

In 1994, Verbrugge and Jette proposed a model which examined factors influencing the disablement process (Figure 9). Using Nagi's model as the foundation, Verbrugge and Jette's model describes social, psychological, and environmental factors

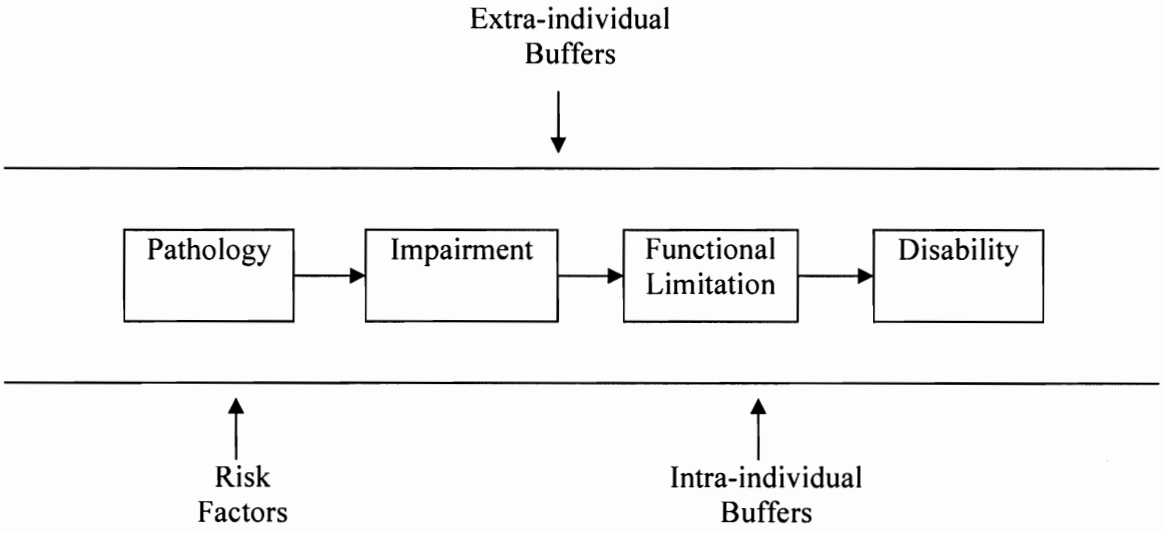


Figure 9: A Model of the Disablement Process (adapted from Verbrugge & Jette, 1994)

that modify the process of disablement by either speeding up or slowing down the onset of disability. Modifiers are divided into three categories: risk factors, extra-individual buffers, and intra-individual buffers. Risk factors are considered predisposing

characteristics that exist prior to the onset of disease (i.e.: demographics, social, lifestyle, behavioral, psychological, environmental, and biological). The term "buffers" represent those interventions that act to prevent, slow down, or reverse the process of disablement. These buffers can be classified into either intra-individual buffers or extra-individual buffers. Intra-individual buffers refer to those actions that come from within the individual. Examples include lifestyle and behavior changes, psychosocial attributes and coping, and activity accommodations. Extra-individual buffers are contributions provided by someone other than the individual. These include medical care and rehabilitation, medications and other therapeutic regimens, external supports such as assistive devices and personal assistance, and modifications to the physical and social environment. Risk factors and buffers are depicted as influencing the main disablement pathway and subsequently quality of life.

Wilson and Cleary: Factors Influencing HRQL

The primary focus of the Verbrugge and Jette model was to examine factors influencing the disablement model. Wilson and Cleary (1995), however, were among the first researchers to delineate a conceptual model that specified pathways influencing HRQL (Figure 10). The model was developed in an effort to aid the clinician in formulating strategies to improve function and overall QOL. Although the flow of causation in the model is depicted as being uni-directional, the authors state the possibility of reciprocal relationships. Likewise, relationships may also exist between non-adjacent levels. However, only dominant associations are depicted in Figure 10.

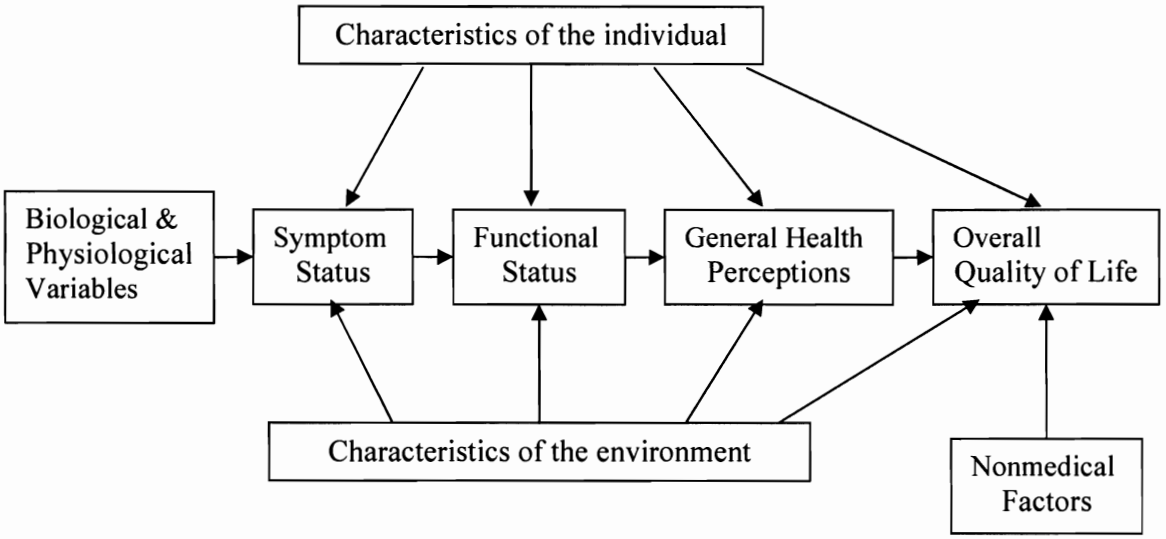


Figure 10: HRQL Conceptual Model (adapted from Wilson & Cleary, 1995)

The model is depicted as having five subsections: biological and physiological factors, symptoms, functioning, general health perceptions and QOL. Biological and physical factors refer to functioning at the cellular and organ system level. Examples include actual diagnoses, laboratory values, as well as measures of physiological function. Symptoms shift the focus from a cellular/organ level to the whole organism.

Symptoms are defined as "a patient's perception of an abnormal physical, emotional, or cognitive state" (Wilson & Cleary, 1995). Functional status refers to an individual's ability to perform defined tasks such as specific actions (i.e.: climbing a set of stairs) and activities (i.e.: shopping). Aside from physical functioning, other areas of functioning commonly measured include psychological, social, and role functioning. General health perceptions refer to an individual's self-perception of health and represents an integration of multiple health concepts.

Symptoms, function, general health perceptions and quality of life are influenced by two outside factors: characteristics of the environment and specific characteristics of the individual. Influences outside of the biopsychosocial realm are considered non-medical factors and influence QOL directly.

Patrick's Model: HRQL Outcomes of Health Care Organization and Delivery

In 1997, Patrick presented a conceptual model based on Donabedian's model of structure, process, and outcomes (Figure 11). Although the primary purpose of the model was to present a framework to examine HRQL outcomes sensitive to health-care organization and delivery, it does provide a conceptualization of how determinants outside the health care system may influence HRQL.

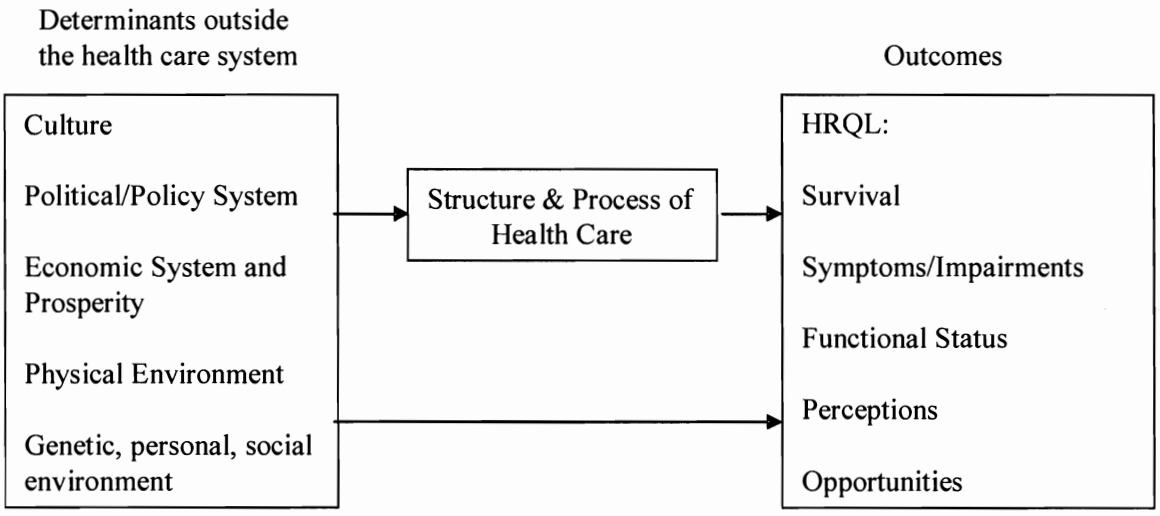


Figure 11: HRQL Outcomes of Health Care Organization and Delivery (adapted from Patrick, 1997)

In this model, HRQL is conceptualized as survival, symptoms/impairments, functional status, perceptions, and opportunity (see Table 2 for definitions of these

terms). Introduced into the model are determinants outside the health care system that have a direct and indirect effect on HRQL.

American Physical Therapy Association (APTA) Model

The model presented in *The Guide to Physical Therapist Practice* (American Physical Therapy Association, 2001) is an adaptation of a previous model examining factors that affect the process of disablement (Guccione, 1994) (Figure 12). The APTA model is perhaps the most comprehensive because it delineates specific pathways influencing the process of disablement and QOL. Although HRQL is not specified in the model, there is consensus based on previous models that HRQL, functional limitation,

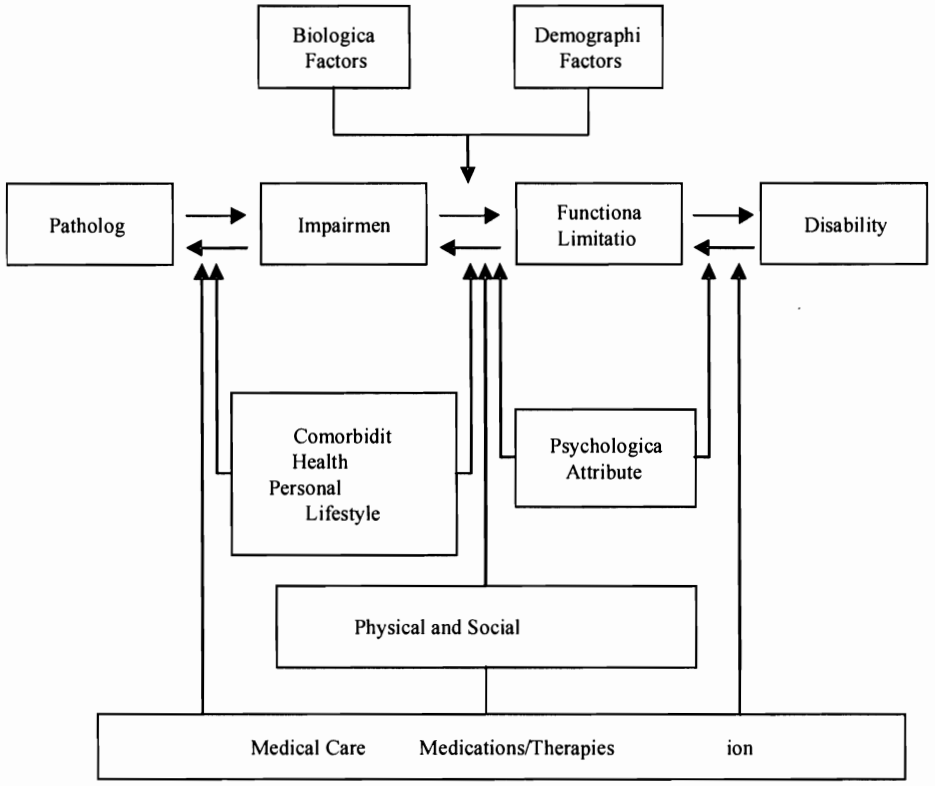


Figure 12: Factors Influencing the Disablement Model (adapted from APTA, 2001)

and disability are overlapping concepts. Therefore, in the APTA model, factors such as physical environment, comorbidities, health habits, and demographic factors are depicted as influencing the disablement model, and hence quality of life.

Summary of Models Depicting Factors Influencing HRQL

Nagi's model of disablement forms the foundation for several models examining factors influencing HRQL. Jette (1994) elaborated on Nagi's model by considering QOL as a dimension subsuming the constructs of functional limitation and disability. The Verbrugge and Jette model (1994) and the APTA model (2001) provide a theoretical framework to examine factors influencing HRQL. In addition, two other models have been used to depict influences on HRQL. Wilson and Cleary (1995) were among the first to specify factors influencing QOL. Patrick's model utilized Donabedian's model of structure, process, and outcome, to conceptualize how the health care system as well as factors outside the health care system influence HRQL outcomes. There is general consensus among the models that many factors, both health related and non-health related may influence HRQL. The factors used in this study are discussed in detail in the following section.

Review of Factors Influencing HRQL

This section reviews studies examining health and non-health related influences on HRQL. These outside influences include medical burden, housing satisfaction, religious/spiritual functioning, socioeconomic status, age, gender, and marital status. Table 3 highlights the literature examining factors influencing HRQL.

Table 3: Factors Influencing HRQL

Factor	References
Medical Burden	(Kempen, Brilman, Ranchor, & Ormel, 1999; Michelson, Bolund, & Brandberg, 2001; Pearson, Stewart, & Rubenach, 1999)
Spirituality and Religion	(Daaleman, Perera, & Studenski, 2004; Idler & Kasl, 1997a; Meisenhelder & Chandler, 2002)
Housing Satisfaction	(Balfour & Kaplan, 2002; Evans, Wells, Chan, & Saltzman, 2000; Feldman & Steptoe, 2004; Steptoe & Feldman, 2001)
Socioeconomic Status	(Cheng, Chi, Boey, Ko, & Chou, 2002; Kempen, Brilman, Ranchor, & Ormel, 1999; Matthews, Smith, Hancock, Jagger, & Spiers, 2005; Peek, Patel, & Ottenbacher, 2005; Thumboo et al., 2003; Yamazaki, Fukuhara, & Suzukamo, 2005)
Age	(Blake, Codd, & O'Meara, 2000; Hopman et al., 2000; Lopez-Garcia et al., 2003; Michelson, Bolund, Nilsson, & Brandberg, 2000; Mishra & Schofield, 1998; Ware, 1994; Wolinsky, Miller, Andresen, Malmstrom, & Miller, 2004; Wood-Dauphinee, 2000)
Racea	(Ford, Havstad, & Kart, 2001; Utsey, Chae, Brown, & Kelly, 2002; Utsey, Payne, Jackson, & Jones, 2002)
Gender	(Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Hemingway, Nicholson, Stafford, Roberts, & Marmot, 1997; Hopman et al., 2000)
Marital Status	(Byles, Feldman, & Mishra, 1999; Loge & Kaasa, 1998; Michelson, Bolund, Nilsson, & Brandberg, 2000; Prause et al., 2005; Sprangers et al., 2000)

[a] Although race is considered a factor influencing HRQL, it was not considered in this study due to the racial homogeneity of the sample.

Medical Burden (MB)

Traditional physiological variables used to determine the degree of one's health have included the number of chronic conditions, number of days spent in the hospital, number of health care visits, and number of medications taken. Studies examining the

relationship between these variables and HRQL have measured HRQL through standard HRQL instruments (i.e.: SF-36, SIP) or have examined the relationship by comparing physiological variables to particular dimensions of HRQL (i.e.: general health perceptions, physical functioning).

The most frequently studied indicator of MB has been an individual's number of chronic health problems. Michelson et al (2001) examined the relationship between HRQL and number of chronic diseases in a random sample of Swedish adults (n=3069) stratified by age. Chronic conditions were assessed by having subjects indicate which of 13 listed chronic health conditions they had. From this, four categories were constructed: no chronic conditions (no problems), 1-2 conditions (few problems), 3-4 conditions (some problems), and 5-13 conditions (a lot of problems). HRQL was measured using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ). The EORTC QLQ consists of five functional scales (physical, role, cognitive, emotional, social functioning), a global QOL scale, and three symptom scales related to cancer. For all age groups, including the ages of 60-69, and 70-79, increased number of chronic health problems was significantly related to reduced HRQL ($p<.01$). A limitation of this study was the use of a condition specific instrument (designed to evaluate quality of life in patients with cancer) in the general population. However, studies using generic HRQL instruments (SF36) have found similar results, demonstrating a positive relationship between number of chronic diseases and HRQL. For example, Kempen et al (1999) interviewed an elderly population aged 57 and older living independently or in adapted housing in the Netherlands. All domains of HRQL, as

measured by the SF-20, were found to be influenced by the number of chronic medical conditions ($p < .001$), after controlling for sociodemographic variables. Chronic medical conditions were measured by asking subjects whether they had any of 18 chronic medical conditions in the 12 months prior to the interview. In another Swedish study, including over 2500 individuals aged 65-79, the presence of chronic disease was positively related to poor self-rated health. Among women, rheumatoid arthritis and cancer had the strongest association with self-rated health (odds ratio = 8.8 and 8.0, respectively). In men, neurological disease and cancer had the strongest association with self-rated health (odds ratio = 9.5 and 5.5, respectively) (Molarius & Janson, 2002).

Despite numerous studies investigating the impact of chronic disease on HRQL, few studies have examined which chronic diseases appear to impact HRQL the most. Sprangers et al (2000) used eight data sets compiled from research groups in The Netherlands, resulting in an analysis of over 15,000 patients with chronic disease (Sprangers et al., 2000). Of the eight samples, six samples included individuals spanning in age of at least four decades. One sample constituted only individuals late middle-aged or over. One sample did not specify age groups. The SF-36 was used to measure HRQL. On the basis of medically confirmed diagnoses, patients were grouped by disease clusters (cancer, cardiovascular conditions, cerebrovascular/neurologic conditions, chronic respiratory diseases, dermatologic conditions, endocrinologic conditions, gastro-intestinal conditions, hearing impairments, musculoskeletal conditions, psychiatric disorders, renal diseases, urogenital conditions, and visual impairments). The results of the study indicated three broad categories of disease clusters that influenced HRQL. Individuals

with urogenital conditions, hearing impairments, psychiatric disorders and dermatologic conditions demonstrated the relative highest levels of HRQL. Individuals with cardiovascular conditions, cancer, endocrinologic conditions, visual impairments and chronic respiratory diseases ranked in an intermediate position. Individuals most adversely affected included those having gastrointestinal conditions, cerebrovascular/neurologic conditions, renal diseases, and musculoskeletal conditions (Sprangers et al., 2000).

Aside from number and type of chronic diseases and its relationship to HRQL, studies have also examined the relationship between HRQL and other medically related parameters such as hospital admissions, medications taken, health care visits, and out-of-pocket health care expenses. Pearson et al (1999) examined the relationship between HRQL (using the SF-36) and hospital readmissions in individuals discharged to home following acute hospitalization. HRQL was assessed in 163 chronically ill, medical and surgical patients (mean age 67.0 +/- 16 years) one month following discharge. Patients were then followed for six months to determine subsequent hospital readmissions. Both physical ($p < .001$) and mental health ($p < .03$) component scores of the SF-36 were lower for individuals with readmission versus the remainder of the cohort. However, a limitation of this study was that measures of HRQL were not performed following one month after discharge. Therefore, the authors are unable to make causal statements regarding the relationship between hospital re-admission and HRQL.

The relationship between HRQL and health care resource utilization (HCRU) has been studied in individuals with rheumatoid arthritis and osteoarthritis (Ethgen, Kahler,

Kong, Reginster, & Wolfe, 2002). HRQL was measured using the SF-36 at six month time intervals. HCRU was self-reported by subjects and included the number of health care provider visits, diagnostic procedures, and hospitalizations over the previous six month period. Higher levels of the physical component score of the SF-36 were associated with a 31% decrease ($p < .01$) in general practitioner visits and a 52% decrease ($p < .01$) in hospitalization rate after controlling for age, sex, marital status, and number of comorbidities. A limitation of the study, however, was the inability to determine cause and effect. Therefore, although HRQL and HCRU were related, it was unclear whether lower HRQL resulted in increased utilization, or if increased utilization improved HRQL.

The number of medications taken has also been associated with components of HRQL. Hershman et al (1995) studied healthy community dwelling adults 75 to 85 years of age. The number of prescription drugs taken was assessed by self-report. Those subjects rating their perceived health as fair or poor consumed a greater number of prescription drugs compared to those rating their self-perceived health as good or excellent. This study, however, did not control for potential intervening sociodemographic variables.

Housing Satisfaction (HS)

A safe environment and adequate housing are widely viewed as valued aspects of human existence. Although these concerns may affect or be affected by health, they are generally not thought of as being related to health and medical concerns (Patrick & Bergner, 1990). There is increasing evidence, however, that the quality and satisfaction

of housing, particularly in the elderly, may significantly impact behavior and well-being (Lawton, Windley, & Byerts, 1982; Scheidt & Windley, 1998; Wahl & Weisman, 2003).

The growing field of environmental gerontology is of particular importance for several reasons. First, older adults overwhelmingly prefer to stay in their homes as long as possible and hence, age in place (Krout & Wethington, 2003). This is evidenced by the fact that the vast majority of older people living in the United States (79%) live independently in either single-family homes or apartments (United States Census Bureau, 1997). Because the majority of elders grow into old age in long occupied residences, elders homes are less likely to have been constructed taking into consideration the housing features needed to enhance functioning in the seniors (Lawton, Weisman, Sloane, & Calkins, 1997). This is of particular importance as research has shown that the older adults spend the majority of time in their home (Evans, Wells, Chan, & Saltzman, 2000; Horgas, Wilms, & Baltes, 1998). Second, research has indicated a reparative role of home environments. Specifically, the home environment often provides an atmosphere that facilitates independence in functional abilities, and serves as a buffer to the threat of loss to personal autonomy and control (Gitlin, 2003). Both personal autonomy and control have been positively associated with psychological well-being in the elderly (Ryff & Keyes, 1995). Lastly, the home is increasingly becoming the primary location for the delivery of short and long term health care (Wahl & Gitlin, 2003).

The relationship between living environment and well-being dates back to the work of Lawton and Nahemow (1973). These researchers hypothesized that the way in which an individual responds to an environmental press, or challenge, is dependent upon

an individual's level of biological, sensorimotor, perceptual, and cognitive competence. Kane and Kane (2000) offer a clear definition and example: "An environment's level of press is defined as the demands placed on people by their environment. Thus, highly competent persons can function in environments that are not very supportive of their limitations, whereas less competent people function at a diminished capacity. The physical environment makes certain functions impossible while encouraging others. To perform successfully and adapt to changes in functioning, a person must match ability levels to demands of the environment". Therefore, a person's well-being represents a balance between the environment and the level of individual competence. With advancing age, it is reasonable to expect declines in aspects of functioning. If the living environment is unable to accommodate these changes in function, the individual will be more susceptible to negative health outcomes (Choi & Wodarski, 1996).

According to Cutler (2000), four characteristics define a successful environment for the elderly. First, the living environment needs to be supportive. That is, the environment supports autonomy in the home and aids in an individual functioning independently. Second, the home needs to be accessible, particularly for individuals using mobility aids. Third, the environment should be adaptable so that it can be easily changed to meet future changes in functioning. Lastly, the environment should be safe. This includes the homes physical setting (e.g.: handrails, fixtures, lighting) as well as neighborhood safety. Additional characteristics that may be related to general well-being include privacy and location.

The living environment can be divided up into several dimensions. Yen and Syme (1999) divide the environment into two dimension: the physical environment and the social environment (Yen & Syme, 1999). Lawton and Nahemow (1973) add a third dimension, the psychological dimensions of the environment (Lawton & Nahemow, 1973). Kane and Kane (2000) suggest yet a fourth dimension, the cultural environment.

The physical environment, also known as the microenvironment (Eshelman, Evans, & Utamura, 2003), refers to the internal characteristics of ones home. This includes such things as the homes infrastructure (i.e.: home in good repair), amenities such as cabinets and other fixtures, support for mobility impairments (i.e.: handrails, door width) and spatial requirements (i.e.: adequacy of room sizes). The social environment, also known as the macroenvironment (Eshelman, Evans, & Utamura, 2003), refers to those features outside of the home such as neighborhood location and degree of privacy. The cultural environment refers to traditions, values, and norms typically found in residential adult-living settings. The psychological environment, often difficult to measure, refers to a person's sensory stimuli, preferences and reactions created by the home environment. Since only two of the four environmental dimensions will be measured in the current study (physical and social), only these dimensions are reviewed below.

Most studies examining the physical and social environment have been limited to young and middle aged adults (Eshelman, Evans, & Utamura, 2003). The little work that has been done with HRQL of the elderly and living environment has primarily been in subjects living in congregate housing facilities (nursing homes, assisted living

arrangements, low income housing, retirement communities) (Eshelman, Evans, & Utamura, 2003). Little is known about the older adults who age in place. Further, while there is some research examining the impact of housing quality on various aspects of functioning (physical, social, and psychological), there are no known studies examining the relationship between housing satisfaction and HRQL using HRQL instruments.

Most of the literature examining health and housing in the older adult have looked at one of the three following areas: 1) whether the physical environment is detrimental to physical or psychological functioning (Connell & Sanford, 1997; Evans, Kantrowitz, & Eshelman, 2002; Gitlin, Mann, Tomit, & Marcus, 2001), 2) the type of hazards in the home (Carter, Campbell, Sanson-Fisher, Redman, & Gillespie, 1997), and 3) the role that physical features of the environment have on adverse health events such as falls (Connell, 1996; Gitlin, Mann, Tomit, & Marcus, 2001). Clearly the literature indicates that environmental hazards are common in the homes of the elderly (Carter, Campbell, Sanson-Fisher, Redman, & Gillespie, 1997; Sattin, Rodriguez, DeVito, & Wingo, 1998), and that the living environment may impede performance of ADLs and IADLs (Gitlin, 2003; Gitlin, Mann, Tomit, & Marcus, 2001). Gitlin et al (2001) used multiple regression to examine the relationship between physical home environmental problems (such as barriers to performing ADLs safely) and physical, psychological, and social functioning in community dwelling older adults (n = 296). Physical home environment was determined by observations made by either a nurse, occupational therapist or self-report by the subjects. Physical disability was measured using the SIP. In addition, measures were used to determine psychosocial well-being including the degree of self-esteem,

depression, and social support. Using stepwise multiple regression, race ($p < .05$), gender ($p < .05$), age ($p < .01$) and physical disability ($p < .001$) were significant predictors of home barriers. None of the psychosocial factors contributed significantly to the model. The data suggested that race, gender, age, and physical disability were risk factors for physical environmental problems. However, due to the cross-sectional nature of the study, it was not possible to determine causal pathways. An alternative explanation may be that physical home challenges may result in limitations in physical functioning and subsequent disability.

The link between living environment and psychological health among children, and to a lesser extent, their mothers, is well established in the literature. In this group of individuals, it has been repeatedly found that individuals living in high-rise apartment complexes have increased psychological distress due to restricted play opportunities and social isolation (Evans, Kantrowitz, & Eshelman, 2002; Ineichen & Hooper, 1974). A smaller number of studies have examined structural housing aspects and mental health. Although cross-sectional studies have revealed mixed results (Freeman, 1984; Halpern, 1995), longitudinal studies appear to indicate that improved housing correlates positively with improvements in psychological health (Elton & Packer, 1986; Wilner, 1962). These studies, however, have looked at children in public, rather than private, housing arrangements. Further, many of these studies are confounded by many variables, the most common being the lack of control for socioeconomic status.

In the elderly population, only one study was found that examined the physical housing aspect and psychological well-being (Evans, Kantrowitz, & Eshelman, 2002).

Community dwelling individuals aged 60 and beyond living in a rural upstate New York county were assessed for mental health and housing quality (n=479). Mental health was determined with a standardized survey instrument used to measure positive affect. Housing quality was determined by interviewer observation regarding housing infrastructure, amenities, support for mobility impairment, and spatial requirements. Using multiple regression techniques, housing quality was found to be significantly related to positive affect ($p<.001$). These findings indicate that housing quality can play a role in psychological well-being, and hence may affect HRQL.

Several studies have examined neighborhood environment and functioning (Balfour & Kaplan, 2002; Malmstrom, Sundquist, & Johansson, 1999; Ross, 2000; Ross & Mirowsky, 2001; Steptoe & Feldman, 2001). However, most studies have examined residential care environments rather than individual residential environments. In addition, only a few studies have been conducted using the older adult population.

Initial efforts to study the relationship between neighborhood and health focused around characterizing the neighborhood in terms of economic status. One of the first studies to examine the relationship between neighborhood environment and health took place in Sweden using a random sample of 9240 individuals aged 25 through 74 years (Malmstrom, Sundquist, & Johansson, 1999). The neighborhood environment was determined by measuring the degree of social deprivation using an instrument called the Care Need Index (CNI). Low CNI values (less than 0) corresponded with affluent areas while high values of CNI (greater than 0) corresponded with deprived areas. Health status was determined by asking subjects to describe their health as either good, bad, or

anywhere in between. After controlling for individual SES, body mass index, smoking, and degree of physical activity, high CNI values were independent risk factors for poor self-reported health status. That is, it appeared that the SES of the neighborhood affected individuals regardless of individual SES. More recently, Steptoe and Feldman (2001) conducted a study examining the relationship between neighborhood problems and health outcomes in residents considered to be from low SES neighborhoods and high SES neighborhoods. Neighborhood problems included issues around cleanliness, safety, and closeness to social activities. Three health outcomes were measured: self-rated health, psychological well-being (using the general health questionnaire) and physical function (using the physical function scale of the SF-36). Subjects aged in range from 18-94 years of age. As expected, neighborhood problems were greater in the low SES neighborhoods compared to the high SES neighborhoods. After controlling for age, sex, and neighborhood SES, high levels of neighborhood problems were associated with lower ratings on self-rated health, greater psychological distress, and decreased physical functioning ability. However, interpretations of both of these studies are limited by the cross-sectional nature of the study and therefore causal interpretations are impossible. For example, in the Steptoe and Feldman study, a limitation in physical functioning or psychological distress may result in an individual viewing their neighborhood as problematic (Steptoe & Feldman, 2001).

The only longitudinal study found that has examined neighborhood environment and functioning in the older population was conducted by Balfour and Kaplan (2002). In this study spanning from 1994 to 1995, the relationship between neighborhood problems

and physical functioning were investigated in subjects 55 years and older living in Alameda County, California. Subjects were asked to rate the seriousness of six common urban neighborhood problems: crime, lighting at night, traffic, excessive noise, trash and litter, and access to public transportation. Subjects were then divided into three groups based on the number of serious problems stated (no problems, one serious problem, more than one serious problem). Physical function was determined at baseline and at 1 year by having subjects rate their level of difficulty in performing nine physical tasks. Overall, the results demonstrated an association between neighborhoods with serious problems and overall loss of function in older adults. More specifically, the risk of functional loss in individuals living in neighborhoods with multiple serious problems was more than twice that of individuals living in neighborhoods reporting no serious problems. Individuals reporting one serious problem had a 50% higher functional loss than individuals reporting no serious problems (Balfour & Kaplan, 2002).

Religious/Spiritual Functioning (RSpF)

Many elderly individuals consider their spiritual lives integral to their well-being. According to a 1994 Gallop Poll, 76% of individuals 65 years and older considered their religion to be very important to them (Princeton Religious Research Center, 1994). However, of all the dimensions of well-being, spiritual health is probably the most elusive and most difficult to measure.

Kane and Kane (2000) note the difference between the terms religion, religiosity/religiousness, spirituality and spiritual well-being and argue that the terms are not interchangeable. Religion typically refers to one's self identified religious

denomination. Religiosity or religiousness refers to the practice of religious behaviors such as attendance at worship services, prayer meetings, and observing rituals. Spirituality refers to the quest for meaning, which may or may not involve religion. Finally, spiritual well-being implies a good spiritual state and has been defined as "the affirmation of life in a relationship with God, self, community, and environment that nurtures and celebrates wholeness" (Moberg, 1984). Of the four terms, spiritual well-being is probably the most difficult to measure. Some have attempted to capture the construct of spiritual well-being by using life satisfaction indices (Culter, 2000).

Despite a lack of consistent terminology in the literature, there appears to be ample empirical evidence indicating a protective effect of one's religion and spirituality on both morbidity and mortality (Byrd, 1988; Comstock & Partridge, 1972; Jarvis & Northcott, 1987; Levin, 1994; Levin, Chatters, Ellison, & Taylor, 1996; Levin & Schiller, 1987; Levin & Vanderpool, 1987; Zuckerman, Kasl, & Ostfeld, 1984). The abundance of studies in well known journals such as *American Journal of Public Health, Journal of the American Medical Association, and Journal of Gerontology*, as well as a proliferation of research funding opportunities, suggest that the association between religion and health is a growing field of interest.

Although some may think that the examination of religiousness, spirituality and health is a relatively new area in epidemiology, over 250 studies dating back to the early 19th century were elucidated in a review of literature conducted by Levin and Schiller (1987). The majority of these studies, however, did not look at religious factors as an

independent variable; rather, researchers compared health status in different religious groups.

Among the religious factors, religiosity and health has been the most common area of study. Typically, religiosity has been measured by the frequency of religious attendance. Levin and Vanderpool (1987) published a review of 27 studies, dating from 1957 to 1986, that examined the relationship between frequency of religious attendance and health (1987). Results of 22 studies indicated a positive significant relationship between the two variables. Nevertheless, Levin and Vanderpool (1987) discussed several methodological and analytical problems with these studies, suggesting that at the time, there was insufficient evidence to imply a beneficial relationship between religious attendance and health. One of the drawbacks of using religious attendance as a variable to measure the construct of religiosity is that attendance at religious services tends to decline with advancing age, particularly over the age of seventy (Ploch & Hastings, 1994). This decline is attributed to declining health as one ages. Therefore, the variable of religious attendance may not capture the construct in persons over age 70. In addition, Ellison (1998) cautions that religious attendance only captures one aspect of religious involvement (behavioral aspect) and researchers may be hasty in dismissing the effect of religion on health who do not find a relationship between health and religious attendance. Ellison also points to the importance of studying direct and indirect effects of religiousness on health via structural equation modeling or path-analytic techniques

More recently, religiousness and spirituality have been shown to have a positive impact on a wide range of health outcomes including physical, social and psychological

dimensions of health. Numerous cross-sectional and longitudinal studies point to the positive effects of religious attendance on psychological well-being (Bergin, 1983; Levin, Chatters, & Taylor, 1995; Levin, Markides, & Ray, 1996; Pollner, 1989; Stark, 1970), even after controlling for relevant covariates including physical health status, and social networks. Literature has also indicated religion's positive affect on well-being (Levin & Vanderpool, 1987), on the positive outcomes of medical problems (Maugans, 1996), and the relationship between spirituality and the decreased incidence of depressive disorders (McCullough & Larson, 1999). In attempting to rule out chance and bias as a reason for these positive relationships, researchers point out that these associations has been found in varying age groups, countries, religious, racial and ethnic backgrounds, differing social class backgrounds, study design and methodologies, and differing types of diseases/illnesses (Ellison & Levin, 1998; Levin, 1994).

Although few studies have specifically examined the influence of religiousness on social aspects of health, several explanations have been offered suggesting pathways linking religion to psychological and social health. Since certain religious denominations promote certain health-related behavior and lifestyles (abstinence from alcohol, tobacco, substance use), that may influence morbidity and mortality rates by reducing chronic disease and enhancing well-being. Therefore, it is hypothesized that religiousness benefits health through promoting preventative health-related behavior (Ellison & Levin, 1998; Idler & Kasl, 1997b; Levin & Schiller, 1987). Although limited, there are some studies suggesting that religiousness may influence psychosocial behavior by providing an avenue of social support, greater opportunities to socialize with friends and family,

and sense of belonging; thereby leading to beneficial effects on health (Idler, 1987; Idler & Kasl, 1997a, , 1997b; Levin & Vanderpool, 1987; Williams, Larson, Buckler, Heckmann, & Pyle, 1991), and in particular, psychological health (Ellison & Levin, 1998). Other less discussed aspects of religiousness may promote better health including improved self-esteem and personal efficacy, improved coping mechanisms and behaviors when dealing with stressful events, increased positive emotions such as forgiveness, contentment and love, and finally health beliefs such as hope and optimism (Ellison & Levin, 1998). Levin (1996) also argues that religiousness has an indirect, rather than confounding, association to health. In other words, the association between religion and health is not due to some other unaccounted factor exerting an effect on the outcome. Rather, religion has an impact on one or more factors that ultimately influence health. Therefore, religion represents a construct that might influence HRQL , rather than a proxy for some other construct or variable, such as social support.

To further explore pathways of how religion affects health, Idler and Kasl (1997b) examined longitudinally the effect of religious attendance on functioning in a representative sample of elderly individuals residing in New Haven, Connecticut (n = 922). The authors reported a persistent relationship between religious attendance and functional ability. Using multivariate regression analysis, the authors then determined whether behavioral or psychosocial variables helped to explain the relationship between religion and functioning. The results indicated that some of the effects of religious attendance on functioning could be explained by higher levels of physical activity of frequent attendees, and higher levels of leisure social activities. However, even after social activities were considered, a significant effect of religion on functioning existed.

The authors concluded that attendance at religious events played an independent role in predicting functional abilities that is not accounted for by better health practices, or by other psychosocial factors with which religious involvement is clearly associated (Idler & Kasl, 1997b). Because of the longitudinal nature of the study, the authors also concluded that religious involvement preceded changes in functioning, and therefore were able to make a case for a causal role of religious involvement. These findings are in agreement with a longitudinal study conducted by Strawbridge and colleagues (Strawbridge, Cohen, Shema, & Kaplan, 1997) that found that reduced mortality risks in the elderly population who had frequent religious attendance was partly due to enhanced social ties and improved health behaviors. However, despite statistical controls for social activities, health behaviors and sociodemographic factors, the positive effects of religious involvement on health persisted (Ellison & Levin, 1998).

Only one study found has examined the relationship between religiousness or spirituality with HRQL instruments. Using Hispanic and African-American individuals who had cancer ($n = 761$; mean age = 57.2 years), Wan et al (1999) used multiple regression to identify factors influencing HRQL. HRQL was measured using the Functional Assessment of Cancer Therapy (FACT) scale. The FACT scale includes five subscales: physical well-being, social well-being, satisfaction with treatment, emotional well-being, and functional well-being. Independent variables included clinical measures of the disease, literacy levels, SES, gender, age, living arrangement, religion, insurance status, and spiritual beliefs. Spiritual beliefs was measured by an aggregate score of 12 items that revealed an individual's sense of purpose in life. The predictor variables explained 51% of the total variance in overall health ($p < .001$). Using stepwise

regression, activity level, extent of disease, Catholic affiliation, and strength of spiritual beliefs explained 50% of the variance in overall HRQL (Wan et al., 1999).

Several studies have examined the relationship between religious/spiritual functioning and components of HRQL. Daaleman (2004) studied adults 65 years and older (n = 277) living in Kansas City. A multivariate model was used to determine the relationship between religiosity and spirituality, and self-assessed health. Results indicated that physical functioning (as measured by the SF-36), quality of life (using the EuroQol) and spirituality (using a six item scale) were independent predictors of good health status. Religiousness (measured by frequency of service attendance and private prayer), however, did not have a significant influence on self-assessed health. Contrary to these findings, Idler and Kasl (1997b) found that increased frequency of attendance at religious services was associated with greater levels of functional ability in community dwelling adults aged 65 and over living in New Haven, Connecticut.

Socioeconomic Status (SES)

The inverse relationship between SES and mortality, and SES and health are well established in the literature, particularly in international literature (Kempen, Brilman, Ranchor, & Ormel, 1999; Regidor et al., 1999). This association has held true regardless of the indicators used to measure SES, whether it be income, occupation, or educational level. However, less is known about the relationship between SES and HRQL.

Income level is the most common proxy that has been used to define SES. Over the past decade, numerous studies have documented that across all age groups, greater levels of economic resources correspond with lower rates of morbidity and mortality (Blane, 1995; Fein, 1995; Fox, 1990; Hart, Smith, & Blane, 1998). Further, it appears

that inequities in health due to socioeconomic differences are widening (Cheng, Chi, Boey, Ko, & Chou, 2002) and continue to persist in later life (Arber & Cooper, 1999). These financial strains may affect physical health, functional abilities, psychological health, and overall well-being (Arber & Cooper, 1999; Mendes de Leon, Rapp, & Kasl, 1994). Some of the mechanisms proposed that may link income level to HRQL include the effect of income level on diet, smoking habits, inadequate living and working environments, and social, psychological and emotional deprivation (Elstad, 1998; Graham, 2001).

In a recent study by Yamazaki et al (2005), annual household income in individuals living in Japan aged 16 years and older was positively associated with HRQL after adjusting for confounding variables. Similarly, Arber et al (1999) found an association between income level and self-assessed health in individuals 60 years and older living in Great Britain. However, this study did not control for confounding variables and therefore the researchers are unable to conclude an independent effect. Literature also has demonstrated that perceived financial sufficiency, in addition to actual income, may influence HRQL in older individuals. In a cross-sectional study of older adults living in public housing in Hong Kong ($n = 450$) (Cheng, Chi, Boey, Ko, & Chou, 2002), researchers found that self-rated economic condition, as measured using a single item question, was significantly related to functional health status ($p < .001$), self-rated health ($p < .001$), and mental health status ($p < .001$) after controlling for sociodemographic variables.

It has been suggested that of all the variables used to measure SES, education level may be the best predictor of good health (Winkleby, Jatulis, Frank, & Fortmann,

1992). However, studies have demonstrated varying degrees of association between education level and HRQL. Kempen et al (1999) studied the association between education level and HRQL using the SF-36. Subjects were late middle-aged and elderly persons living in either independent or adapted housing in the Netherlands (n = 5279). Using a Pearson correlation analysis, results indicated that level of education was significantly correlated with all HRQL domains ($p<0.001$). However, these correlations were quite low (physical function r = 0.199; role function = 0.110; social function = 0.162; health perceptions 0.096; bodily pain -0.077; mental health 0.134), indicating the association between the variables was weak.

Studies also have examined educational level and specific aspects of HRQL. For example, Kehn (1995) found that educational level was not significantly correlated with levels of happiness in noninstitutionalized elders. Similar findings were demonstrated in a study examining the association between SES and HRQL in men with prostate cancer (n = 860; mean age = 66.6 years) (Penson et al., 2001). In this study, HRQL was measured using the SF-36 and education level was categorized into three variables: high school graduate or less, some college education, or college graduate or higher. At baseline, HRQL was minimally associated with education level, with the only significant association being between education level and social functioning ($P<.009$). In a one year follow-up of HRQL measurements, education had little effect on HRQL outcomes. In the same study, annual income predicted higher HRQL scores at baseline, but had little effect on HRQL over time.

In contrast to the above studies, Thumboo et al (2003) found years or education to be positively associated with HRQL (using the SF-36) in an Asian population 21-65

years of age. Similar results were reported by Kempen et al (1999) in older individuals (57 years and over) living in the Netherlands. This study found level of education to be significantly correlated with six domains of the SF-20.

Age, Gender, Marital Status

As would be expected, HRQL has been found to decrease with increasing age. This is true when comparing adults 60-69 years of age with 70-79 years of age (Michelson, Bolund, & Brandberg, 2001), and comparing adults 55-64 years of age with 65-74 years of age (Brazier et al., 1992). These results have been reported using the EORTC QLQ-C30 instrument and the SF-36 to measure HRQL (Michelson, Bolund, & Brandberg, 2001; Sprangers et al., 2000). To date, there are no studies found that have compared HRQL in the old-old population (80+ years) to the young-old elderly. However, there are studies that have examined the relationship between age and specific dimensions of HRQL. For example, Demura and Sato (2003) demonstrated that levels of depression in community dwelling adults increases in the elderly greater than 75 years compared to those individuals younger than 75 years. Despite the abundant studies, only one study found has examined the independent effect of age on HRQL. Wolinsky (2004) studied African Americans aged 49-65 years old. The study concluded that age, along with other demographic variables contributed very little to each of the SF-36 scales.

Research reporting the association between gender and HRQL has varied. Most studies have found that women have decreased levels of HRQL compared to men regardless of age (Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Hemingway, Nicholson, Stafford, Roberts, & Marmot, 1997; Hopman et

al., 2000). However, in a study by Michelson et al (2001) using a random sample of over 4000 individuals living in Sweden, only small gender differences were found in HRQL. Similarly, Blake et al (2000) found no difference in HRQL based on gender in a random sample of subjects aged 18 and over living in Ireland. However, much like age, these studies used a univariate approach and no conclusions were drawn regarding the independent effect of gender on HRQL.

The most comprehensive cross-sectional study examining the relationship between marital status and HRQL in the older adult was conducted by researchers in Australia (Byles, Feldman, & Mishra, 1999). A random sample of over 12,000 women aged 70-75 participated in a mailed survey. HRQL was determined using the SF-36. Marital status was divided into three groups: those married/defacto (defacto implies those individuals in a committed relationship but not legally married), those widowed less than 12 months, and those widowed longer than twelve months. Results indicated that women who were widowed less than 12 months demonstrated the lowest self-rating of health. In addition, means for all subscales of the SF-36, as well as the mental health component summary score, were significantly lower for women widowed less than 12 months compared to married women. These differences persisted after controlling for sociodemographic factors. There were no significant differences in HRQL when comparing married women to women widowed longer than 12 months, suggesting that lower ratings of HRQL in recent widows appear to resolve with time (Byles, Feldman, & Mishra, 1999). Several other studies, looking at both men and women, have shown that subjects who are married or partnered have higher levels of HRQL compared to subjects

who are single or live alone (Loge & Kaasa, 1998; Michelson, Bolund, Nilsson, & Brandberg, 2000; Prause et al., 2005; Sprangers et al., 2000). For example, Prause et al (2005) used the Quality of Life Index to determine the influence of sociodemographics on HRQL in an Austrian sample aged 14 years and over. The study showed that married individuals had improved levels of HRQL compared to single or divorced individuals. Likewise, in a study by Sprangers et al (2000), using a large sample living in the Netherlands, subjects reporting living with a partner had betters scores on the SF-36 compared to those not married or living alone. Despite these findings, the analysis in the above studies were limited to univariate techniques. Therefore, the independent effect of marital status is unclear. Only one known study to date has used a multivariate approach to study marital status and HRQL. In a study by Wolinsky et al (2004), marital status was found to have only a minimal effect on HRQL in middle aged African Americans, explaining less that five percent of the total variance in HRQL.

Summary of Review of Literature

By the year 2040, the elderly population is projected to represent 20% of the total population. The increase in this population will result in an increased demand for health care, as elders will be living longer with chronic health conditions. Patient centered outcomes, such as HRQL measurements, will aid in understanding how health care affects an elderly individual's well-being.

Several conceptualizations have been put forth to depict HRQL. While each conceptualization differs in some regard, all conceptualizations have at its core the

concept of physical, psychological and social functioning. The conceptualization most studied and utilized is the SF-36, developed by John Ware.

In addition to models conceptualizing HRQL, several researchers have proposed models depicting external factors influencing HRQL. Examples of factors thought to influence HRQL include the physical environment, the social environment, comorbidities, lifestyles, and demographic factors.

The final section of this chapter reviewed the literature on the impact of several health and non-health related factors on HRQL. Research indicates a relationship exists between HRQL and medical burden, housing satisfaction, religiosity/spirituality, and sociodemographic factors. These factors form the basis of the proposed structural equation model discussed in Chapter 3.

CHAPTER 3

Conceptual Models and Research Hypotheses

To address the research question, it was necessary to first create a model of HRQL based on the available literature. The model of HRQL was then tested, modified, and used to determine factors influencing HRQL. This chapter describes the conceptualization of both the HRQL model and the full model examining factors influencing HRQL. The chapter concludes with the research question and hypotheses.

Conceptualization of HRQL

Although HRQL is a frequently measured health outcome, considerable variation exists in the definition of HRQL and the dimensions used to develop conceptual models of HRQL. A widely used model, the RAND Medical Outcomes Study (MOS), defines HRQL as "the extent to which health impacts an individual's ability to function and his/her perceived well-being in physical, mental, and social domains of life" (Hays, Hahn, & Marshall, 2002). Patrick and Erickson (1993) define HRQL as "the value assigned to the duration of life as modified by impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy".

There are several commonly used HRQL instruments, although similar constructs may be defined differently in different measurement tools. Table 4 compares HRQL

Table 4: Comparison of Domains used in Three Conceptualizations of HRQL

Domain	SIP	SF-36	Patrick Model
Physical functioning	X	X	X
Social functioning	X	X	X
Psychological functioning	X	X	X
Cognitive functioning	X		X
Sexual functioning	X		
General health perceptions		X	X
Energy/fatigue	X	X	X
Pain	X	X	
Death and duration of life			X
Opportunity			X

domains for three common conceptualizations: the Sickness Impact Profile (SIP)(Bergner, Bobbitt, Carter, & Gilson, 1981; Bergner et al., 1976), the Medical Outcomes Study 36 Item Short Form Health Survey (SF-36)(Ware & Sherbourne, 1992), and the conceptualization of HRQL developed by Patrick (1997a) and Patrick & Erickson (1993a).

As shown in Table 4, a commonality among these three models include an assessment of physical, psychological, and social functioning (Kane & Kane, 2000; Ware, 2003; Ware & Sherbourne, 1992). These three dimensions are also included in several other commonly used HRQL instruments such as the Quality of Well-Being Scale

(QWB) (Kaplan & Anderson, 1988), the Dartmouth COOP Charts (Nelson *et al.*, 1987), the Nottingham Health Profile (NHP) (McEwen & McKenna, 1982), and the Multi-level Assessment Instrument (MIA) (Lawton, Moss, Fulcomer, & Kleban, 1982). Therefore, there appears to be general consensus among health care researchers that these three constructs should be included in the assessment of HRQL.

Also captured in these three conceptualizations is the dimension of energy/fatigue. This dimension is frequently subsumed under the heading of vitality (Sousa & Chen, 2002; Ware & Sherbourne, 1992), and is found in several other HRQL instruments (Bergner, Bobbitt, Carter, & Gilson, 1981; Kaplan & Anderson, 1988; McEwen & McKenna, 1982).

Outside of the four dimensions of HRQL (physical, psychological, social functioning, energy/fatigue) there is considerable variability among HRQL instruments. Cognitive functioning is included in Patrick's model and the SIP, but not in the SF-36. Pain is considered a dimension of HRQL in the SIP and SF-36, but not included in Patrick's conceptualization. General health perceptions is included in the SF-36 and Patrick's model, but not in the SIP. Death and duration of life, and opportunity (the potential for an optimal state of health) are two dimensions of HRQL only considered in Patrick's conceptualization of HRQL. There is also considerable variability in the variables used to measure each dimension of HRQL. Table 5 gives examples of how each of these constructs have been measured.

Table 5: Examples of Variables used to Measure Dimensions of HRQL

Dimension	Example of variables
Physical functioning	Ability to ambulate, perform ADLs, degree of mobility, frequency of exercise
Social functioning	Social interaction with friends, family, community
Psychological functioning	Degree of happiness, distress, depression, morale
Cognitive functioning	Degree of alertness, orientation, ability to reason
Sexual functioning	Level of intimacy, feelings of closeness
General health perceptions	Self-rating of health
Energy/fatigue	Quality of sleep, self-rating of pep/energy
Pain	Degree of bodily pain, impact of pain on function
Death and duration of life	Mortality rates, years of life lost, survival rates
Opportunity	Social or cultural disadvantages interfering with optimal health, resilience to withstand forces normally interfering with optimal health

Model of HRQL

The secondary data set used in this study did not utilize a prepackaged HRQL instrument. Therefore, a model of HRQL was created based on conceptualizations in the literature. The model of HRQL used in this study is shown in Figure 13. By convention, the circles represent unobserved latent variables. The single headed arrows represent regression paths indicating the impact of each variable on one another.

Of the various dimensions of HRQL reported in the literature, the three most common factors (physical, social and psychological functioning) were incorporated into the HRQL model used for this study. General health perception was also chosen to be in the model as this construct is a common measurement used in gerontological HRQL

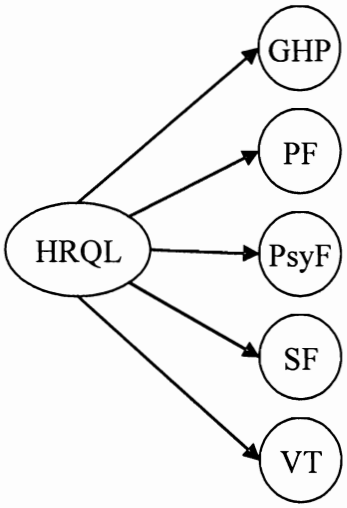


Figure 13: Model of HRQL
(GHP = general health perception; PF = physical functioning; PsyF = psychological functioning; SF = social functioning; VT = vitality)

research (Baron-Epel & Kaplan, 2001; Kaplan & Baron-Epel, 2003). Sexual functioning is included under social functioning since this dimension relates to level of intimacy, a variable often included in social functioning scales (Cutrona & Russell, 1987). Although pain is a common dimension among most HRQL instruments, it was not included in the model of HRQL because it is an impairment level measure, while the remaining dimensions are at the functional or disability level. Further, literature indicates that pain may only be weakly related to functional status (Hazard, Haugh, Green, & Jones, 1994; Leveille et al., 1999; Waddell, 1987). The remaining variables listed in Table 5 were not captured in the proposed model as they are not common dimensions used in HRQL instruments.

The model of HRQL hypothesizes that the relationships among constructs can be represented by a second-order structure, which consists of one higher order general

construct (HRQL) and five lower order constructs (GHP, PF, PsyF, SF, VT). These factors or constructs, also referred to as latent variables, cannot be observed or measured directly. Linking the latent variables to indicators that are measurable make the measurement possible (indicators are not shown in Figure 13). In essence, observed variables "serve as indicators of the underlying construct that they are presumed to represent" (Byrne, 2001).

Model of Factors Influencing HRQL

Formulation of the hypothesized model was derived from the consensus of findings from the review of the literature. Although there are no models that examine the relationships among all the constructs proposed in this study, the American Physical Therapy Association (APTA) offers a conceptual model in *The Guide to Physical Therapist Practice* (2002). In the Guide, HRQL encompasses Nagi's Model of Disablement, as well as non-health related factors that influence general well-being and HRQL. Wilson and Cleary (1995) developed a model examining the relationships among measures of patient outcomes in a HRQL conceptual model. This model described environment, individual characteristics, and general health perceptions, as well as nonmedical factors directly influencing overall quality of life.

Figure 14 delineates the full structural model to be tested in this study. The right side of the model represents the HRQL measurement model, as described in the previous section. The left side of the model represents the constructs and variables proposed to influence HRQL. By convention, the circles represent unobserved latent variables (HS, SES, MB, RSpF), and the rectangles represent observed variables. The single-headed

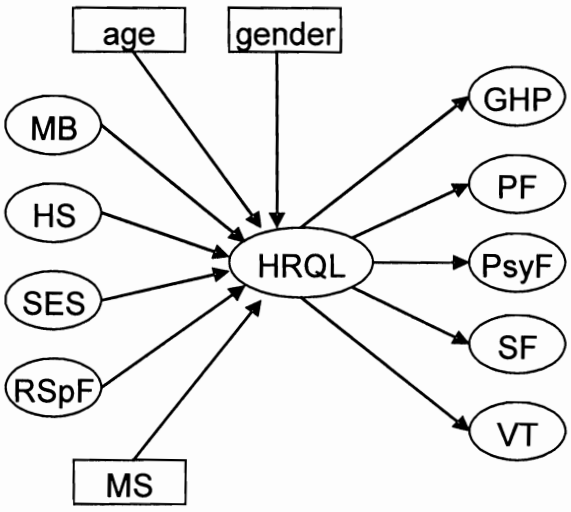


Figure 14: Theorized Relationships of Factors Influencing HRQL
(GHP = general health perceptions; PF = physical functioning;
PsyF = psychological functioning; SF = social functioning; VT = vitality;
MB = medical burden; RSpF = religious/spiritual functioning;
SES = socioeconomic status; HS = housing satisfaction; MS = marital status

arrows pointing towards HRQL represent the impact of these variables on HRQL. Table 6 lists the latent constructs and observed variables used in this study. These measures are discussed in further detail in Chapter 4.

Table 6: Latent Constructs, Observed Variables and Measures used in the Full Structural Model

Latent Construct	Observed Variable	Measure
Physical Functioning (PF)	Limitations in bodily movements and self-care activities (PF1)	Vigorous activity, moderate activities, lifting, climbing, walking uphill, bending, walking one block, walking several blocks, walking one mile, eating/bathing/dressing/toileting
	Home mobility (PF2)	In bed/chair most of day
	Community Mobility (PF3)	Assistance to travel in community
	Exercise level (PF4)	# times/week exercise

Psychological Functioning (PsyF)	Positive affect (PsyF1)	Cheerful, in good spirits, extremely happy, satisfied, full of life, calm and peaceful
	Negative affect (PsyF2)	Sadness, nervous, restless, hopeless, everything an effort, worthless
	Purpose in life (PsyF3)	Wander aimlessly through life, life one day at a time, done all there is to do in life
	Life Satisfaction (PsyF4)	Rate life at present time
Social Functioning (SF)	Attachment (SF1)	Personal relationships, strong emotional bonds, feeling of intimacy
	Social Integration (SF2)	Feel part of group, people who enjoy same social activities, shares interests and concerns, likes the things I do
	Reliable Alliance (SF3)	People I can depend on, someone to come to my assistance, people to count on in emergency
	Guidance (SF4)	Someone to turn to for guidance, someone I can talk to, trustworthy person I can turn to, someone I feel comfortable talking to
	Instrumental Support – get help (SF5)	Have family/friends who could help you when you are sick by running errands, give gifts, give money, fix things around house, do household chores, give advice, provide transportation, prepare meals
	Instrument Support – give help (SF6)	Can give help to family/friends when they are sick by running errands, give gifts, give money, fix things around house, do household chores, give advice, provide transportation, prepare meals
Social Functioning (SF)	Volunteer (SF7)	Hours/month volunteer
	Work (SF8)	# hours/week of paid employment
General Health Perceptions (GHP)	General perception (GHP1)	How has your health been lately
	Age comparison perception (GHP2)	Compare health to others your own age
Vitality (VT)	Sleep (VT1)	Quality of sleep
	Pep/Energy (VT2)	How much pep/energy

Medical Burden (MB)	Chronic conditions (MB1)	# new illnesses; other health problems
	Medical expenditures (MB2)	Total out of pocket costs
	Hospital, nursing home, respite stays (MB3)	# times stayed in hospital, nursing home, respite at least overnight
	Visit with health care professional (MB4)	# times spoken with MD, nurse, specialist, other health care provider
	Medications (MB5)	# of medications prescribed
Religious/Spiritual Functioning (RSpF)	Religious attendance (R/SpF1)	How often attend religious services
	Watch religious services (R/SpF2)	How often watch religious services on TV
	Importance (R/SpF3)	How important is religion/spirituality
Housing Satisfaction (HS)	Home Satisfaction (HS1)	Comfortable living unit, do not like living here, ideal living environment, pleasant living unit
	Privacy Satisfaction (HS2)	As much privacy as needed, consider place my own, interaction with people I prefer not to, easy to find quiet spot
	Neighborhood Satisfaction (HS3)	Location near friends, location near relatives, access to shopping, near medical services, near park, availability of public transportation, safe and crime-free neighborhood, near downtown
	Residential satisfaction (HS4)	How satisfied with getting what you pay for at your residence
	Living Environment Satisfaction (HS5)	Satisfaction with interior of home
Socioeconomic Status (SES)	Income (SES1)	Total household income
	Financial abilities (SES2)	How much difficulty meeting monthly payments on bills
	Education (SES3)	Level education completed

Research Question and Hypotheses

Research Question

This study addresses the following research question: What constructs and variables influence HRQL in community-dwelling adults aged 60 years and over?

Hypotheses

The relationships among the constructs depicted in Figure 14 represent the full structural equation model. The hypothesized relationships within the model are listed below:

H1: Medical Burden (MB), Religious/Spiritual Functioning (RSpF), Housing Satisfaction (HS), Socioeconomic Status (SES), marital status, gender, and age will predict HRQL.

- **H1a: Increased levels of medical Burden (MB) will have a negative impact on HRQL**
- **H1b: Greater involvement in religious/spiritual functioning (RSpF) will have a positive impact on HRQL**
- **H1c: Higher levels of socioeconomic status (SES) will have a positive impact on HRQL**
- **H1d: Higher levels of satisfaction with housing (HS) will have a positive impact on HRQL**
- **H1e: Single older adults will have diminished levels of HRQL compared to married/partnered older adults**
- **H1f: Increasing age will have a negative impact on HRQL**
- **H1g: Older adult women will have diminished levels of HRQL compared to older adult men**

CHAPTER 4

Methods

This chapter describes the study design, sample, and the measures used to develop the constructs and observed variables. Also included in this chapter is the validation of the HRQL measurement model, which serves as the basis for the development of the full structural model.

Design

This study was a non-experimental retrospective design using secondary data from the "Pathways to Life Quality" study (Krout & Wethington, 2003). The "Pathways" study was a collaborative research project that was conducted by the Gerontology Institute at Ithaca College and the Bronfenbrenner Life Course Center at Cornell University, both located in Tompkins County, Ithaca, New York. The Pathways study, initially designed to determine housing changes and quality of life as people age, was a longitudinal study that began with wave 1 data collection in 1997. Data was collected every two years: wave 2 data was collected in 1999, and wave 3 in 2001. The current investigation utilized the community dwelling random sample who participated in wave 3 of data collection.

This study was approved by Virginia Commonwealth Institutional Review Board according to exempt review criteria.

Pathways Data Set

The sample used for this study was drawn from wave 3 of the Pathways data set. This first section details the sampling method and the data collection process for the Pathways to Quality Life sample. Following this, a description of the wave 3 data set is detailed.

Pathways to Life Quality Sample

The Pathways to Quality Life sample consisted of elderly individuals who lived in one of four residential settings: 1) continuing-care retirement community (CCRC), 2) residential assisted-care unit or mixture of independent and assisted living, 3) subsidized independent-housing apartments designed for older adults, and 4) the general community. Initial wave 1 recruitment efforts for the CCRC, assisted living, and subsidized housing included recruitment presentations, newsletter announcements, fliers, and recruitment packets distributed on doors. For the community-dwelling older adults, a random sample of 3000 community participants was drawn from a list of 13,197 Tompkins County residents over 60 years of age living independently in the community. This list was derived from voter registration lists and the purchase of age-targeted lists from a professional sampling organization that culls names from voter registration lists, phone directories and other sources. To ensure this sample did not over-represent wealthier residents, 1600 additional names were culled from the Senior Citizens' Council/Area Agency on Aging mailing list and were added to the list from which the random sample was drawn. Once the list was established, participants were recruited via letter and follow-up telephone call. Spouses were also invited to participate. Periodic

augmentation of the random sample occurred throughout the three waves of data collection using the same randomization methods used at baseline. Augmentation of the remaining three facility types (CCRC, residential assisted-care unit or mixture of independent and assisted living, subsidized independent-housing apartments) occurred by having new residents become part of the next wave of data collection. Reasons for loss of the original wave 1 participants included death, loss of contact due to relocation, cognitive deterioration or other health declines.

Pathways Inclusion and Exclusion Criteria

Three inclusion criteria had to be met for participation in the Pathways study. First, subjects had to be 60 years of age or above at the time of recruitment. The original focus of the pathways project was to study residential housing patterns and residential transitions over the life course. Since most of the older adult residential settings in Tompkins County restrict entry until 62-65 years of age, the community sample subjects were recruited as young as age 60 in order to study these individuals prior to transitioning into alternative living situations (Henderson & Oggins, 1999). Second, subjects had to be a permanent resident of Tompkins County, New York. Since a significant goal of the Pathways study was to include Ithaca College and Cornell University students as interviewers, proximity of participants to the colleges was of important. Additionally, faculty and administration at both Cornell University and Ithaca College had an established relationship with the congregate housing facilities in Tompkins County, making these housing facilities prime targets for data collection. Lastly, the funder of the project had a specific interest in the continuing care retirement community used in this

study (Krout, 2005). The final criteria for participation in the Pathways study was that participants had to meet basic health and cognitive requirements to ensure completion of the interview and improve reliability of the responses. During initial wave 1 recruitment efforts, subjects were screened for cognitive competency by examining responses to questions concerning day, date, and the township or village of residency. Subjects were excluded if they were unable to correctly answer any of these three questions. In subsequent waves of data collection, there was no formal cognitive screening process. However, all subjects were asked if they were currently under medical treatment for memory problems. In addition, the interviewer noted any cognitive problems during the interview. Individuals with either memory or cognitive problems were not included in the final data set used for the current study.

Pathways Data Collection

Pathways data was collected via one-on-one interviews with subjects. All data for the Pathways study were collected by either students trained in interviewing techniques, or by Pathways staff. Each student participated in a 10 hour training session which included information on five different areas: 1) how to conduct a research interview, 2) informed consent procedures and human subjects review, 3) how to schedule an interview and perform recruiting over the phone, 4) how to follow the skip patterns within the interview and 5) how to handle difficult situations and early interview terminations. Following the training, interrater reliability was determined by having each student (n = 40) observe a videotaped interview, marking answers into the interview booklet. Interrater reliability was determined for wave 2 and wave 3 and revealed a

reliability coefficient of .90 and .87, respectively (Holmes, 2003). No other information regarding these reliability studies are available. Students were also given opportunities to practice conducting the interview. Before students were cleared for interviewing, a mock interview was completed with a staff member.

Interviews took approximately two hours to complete. Most of the interviews were conducted at the individual's home. A small number of individuals (n = 12) completed the interview by mail. Interviewers read all questions aloud and recorded the participant's responses directly in the questionnaire booklet.

Wave 3 Data Set

Since many of the Pathways survey questions were added, deleted, or altered with each wave of data collection, a longitudinal study design was not feasible. Therefore, the study design was cross-sectional, using only wave 3 data. Wave 3 was chosen because it contained the most applicable survey questions related to the current research question. A summary of data processing and analysis used in this study is diagrammed in Figure 15. The remainder of this chapter will detail each of these steps.

Wave 3 Sample

The original Pathways data set consisted of 1190 subjects. These subjects participated in one or more waves of data collection. In order to be part of the final sample used in the current study, subjects had to meet the following inclusion criteria: 1) participated in wave 3 data collection, 2) lived in the general community, 3) were 60 years and older, 4) were not taking any medication for memory loss, 5) were not noted by the interviewer to have any cognitive problems during the interview, and 6) answered all

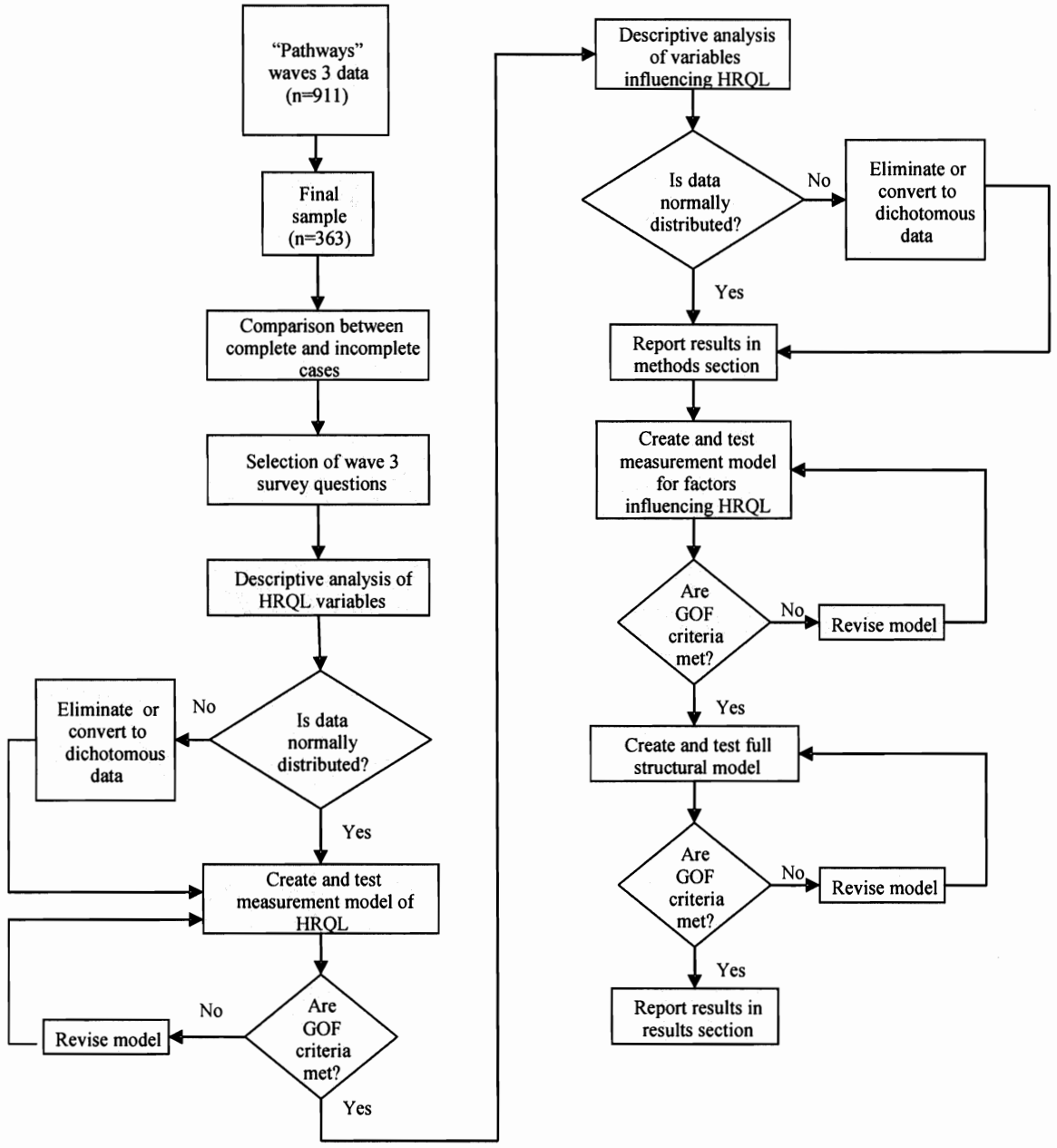


Figure 15: Flow Diagram of Methods

questions included in the data analysis. Table 7 summarizes the breakdown of cases excluded from the study.

Table 7: Breakdown of Cases Based on Exclusion Criteria

Exclusion Criteria	Number of Cases Eliminated
Did not participate in wave 3 data collection	279
Did not live in general community during wave 3	414
< 60 years of age	2
Cases with missing data	132
Total	827

The community-dwelling random sample was chosen because of the random sampling technique used, thus reducing the likelihood of a biased sample. Comparison of the random sample with the 1990 county census revealed representativeness of the community sample when comparing age distribution, race, sex, marital status, and income (Henderson & Oggins, 1999).

The community-dwelling sample in wave 3 of the Pathways study consisted of 499 individuals ranging from 58 to 103 years of age (although subjects were supposed to be aged 60 years or above at the time of recruitment, data on two subjects less than 60 years of age were collected. These two subjects were eliminated from the data set). In the United States, "elderly" is defined in a variety of ways. Traditionally, 65, the age at which a person qualifies for full retirement, has been considered the beginning of old age

(Ohio Department of Aging, 2004). However, the literature shows considerable variability in the definition of what age constitutes "elderly". Some studies have considered 55 years and older as "elderly" (Grundy & Glaser, 2000; Ren & Chang, 1998; Wolinsky & Johnson, 1992), others consider 60 and older to constitute "elderly" (Markides & Lee, 1990), while still others classify those over 65 as "elderly" (Idler, 1993; Leinonen, Heikkinen, & Jylha, 1999; Mossey, Havens, Roos, & Shapiro, 1981). In the current study, elderly was defined as those individuals 60 years and older. This resulted in a total of 497 subjects.

Listwise deletion, the removal of all cases with missing data for the variables of interest was implemented to derive a final sample which only included cases with complete records (n=363). Listwise deletion is a common method for handling incomplete data sets (Byrne, 2001). In order to determine the extent of bias in the sample, comparisons between cases with missing data and cases with complete data were performed using SPSS 13.0 (Copyright ©, SPSS, Inc., 1989-2004, Chicago, IL), and Microsoft ® Excel 2002 (Copyright ©, Microsoft Corporation, 1985-2001). An independent samples t-test was used to compare continuous variables; a chi-square test was used to compare dichotomous variables. An alpha level was established at $\alpha = .05$. There were no significant differences between subjects with and without missing cases based on age, gender, marital status, or educational level. There was a significant difference based on yearly income. Specifically, individuals with missing data had a significantly greater proportion of subjects with a yearly income less than 15,000 (Table 8).

Table 8: Comparison of Subject Characteristics with Complete and Incomplete Data Sets.

		Complete n=363)		Missing (n=132)			
Interval data		Mean	SD	Mean	SD	t	p
age (years)		74.9	8.5	73.6	7.2	1.690	.092
Dichotomous data		**Proportion (%)**		**Proportion (%)**		**X^2**	**p**
gender	male	39.1		38.8			
	female	60.9		61.2		.004	.951
marital status	married/partnered	64.7		64.2			
	not married/partnered	35.3		35.8		.011	.917
education	< 8th grade	0.0		0.3			
	some high school	8.5		4.4			
	high school graduate	17.7		26.4			
	some college	16.2		21.2			
	college graduate	18.5		15.4			
	some graduate school	6.9		5.0			
	graduate degree	32.3		27.3		10.429	.108
yearly income	< 15,000	5.5		20.8			
	15,000-19,999	9.9		8.3			
	20,000-29,999	13.5		14.6			
	30,000-39,000	14.9		13.5			
	40,000-49,000	9.9		10.4			
	50,000-59,000	11.6		7.3			
	60,000-74,999	12.4		8.3			
	75,000-99,999	9.9		6.3			
	≥ 100,000	12.4		10.4		51.980	.000*

*significant at $p < .05$ exists at yearly income < 15,000

Wave 3 Survey Questions

The Wave 3 survey contained 151 questions, of which 123 were closed-ended. The 151 questions were divided into six sections: lifestyle (21 questions), life satisfaction (11 questions), housing (38 questions), moving (9 questions), health (59 questions), and income/demographics (13 questions). Of the 151 wave 3 survey questions, 117 questions were dropped as they were not used to define any of the constructs or observed variables in this study. Only selected questions related to lifestyle, life satisfaction, housing, health, and sociodemographics were retained. This resulted in 34 closed-ended questions in the final data set (Appendix A). Limitations imposed by using a secondary data set are discussed in Chapter 6.

Data Analysis

Descriptive Statistics

In order to meet the assumptions of structural equation modeling (the analysis used in this study), data must be either continuous or dichotomous (Byrne, 2001; Garson, 2005; Jewell, 2003). However, literature suggests that ordinal data may be appropriate to use when the number of categories is four or higher, and data do not display skewness and kurtosis (Garson, 2005; Green, 1997). Single item questions used in this study that were ordinal and had four or less categories were converted to dichotomous data. Variables with five or more categories were treated as continuous data, with an assumption that there was an equal distance between response choices. Variables that were determined by averaging several likert scales were treated as continuous data. Problems associated with treating ordinal as continuous data are discussed in Chapter 6.

Continuous variables were screened for normality. Although there are no universal standards for determining departures from normality, there is general consensus that the larger the sample size (e.g.: >50), the less effect departures from normality have on the statistical analysis. Based on recommendations by Tabachnick & Fidell (1996), departures from normality were determined by the size of the skewness and kurtosis. Variables with skewness greater than 2.0 and kurtosis in excess of 5.0 were considered non-normal (Moss, 2006). Although data transformations are often recommended for variables that fail tests of normality, these transformations frequently make the interpretation difficult. Therefore, variables exhibiting non-normality were converted to dichotomous data. Means and standard deviations were calculated for the continuous variables used for the measurement models. Distributions of dichotomous data were presented as percentages. SPSS© statistical package (version 13.0) was utilized for this phase of the analysis.

Multivariate Statistics

Structural equation modeling (SEM) was used in this study to test the hypothesized model and research question. SEM is a series of statistical techniques that allows one to examine the relationships between one or more independent and dependent variables (Tabachnick & Fidell, 1996). Essentially, SEM determines to what extent the sample data is consistent with the hypothesized model (Musil, Jones, & Warner, 1998). One advantage of using SEM is that it allows latent variables or constructs to be defined by multiple observed variables. Therefore, constructs are not restricted to a single measure. Multiple measures in combination provides a more complete representation of the latent variable (Quintana & Maxwell, 1999)

The general structural equation model consists of two complimentary models: the measurement model and the structural model. Confirmatory factor analysis (CFA) is a special application of SEM and is used to validate measurement models by examining the extent to which indicators measure the underlying theoretical construct (Hoyle & Smith, 1994; Musil, Jones, & Warner, 1998). The structural model examines the relationships between observed and latent independent and dependent variables, and determines the extent to which predictor variables adequately explain the variance in outcome variables (Musil, Jones, & Warner, 1998).

Structural equation models, by convention, are schematically represented using geometrical symbols. Figure 16 identifies the symbols and measurement terms used to represent the structural model (Hwang, Weller, Ireys, & Anderson, 2001; Jewell, 2003). A circle (or ellipse) represents an unobserved (latent) variable; a rectangle represents an observed variable; a single-headed arrow represents the impact of one variable on another; a double-headed arrow represents the correlation between a pair of variables. Latent variables can either be exogenous or endogenous. Exogenous latent variables are synonymous with independent variables. Endogenous latent variables are synonymous with dependent variables and are influenced by the exogenous variables in the model. Lastly, each observed variable is associated with an error term. This error term represents measurement error and reflects the adequacy of measuring the underlying factor. Residual error refers to the error associated with the prediction of an endogenous variable from a exogenous variable (Byrne, 2001).

Confirmatory factor analysis (CFA) was used to test the measurement models. Structural equation modeling was used to test the full structural model. SEM analysis

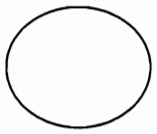
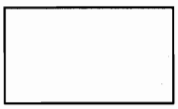
Symbols	Measurement Terms
 A latent (unobserved) construct	ξ = xi, an exogenous latent variable Γ = gamma, relates exogenous to endogenous construct or variable η = eta, an endogenous latent variable β = beta, relates endogenous constructs to one another ζ = zeta, an error term for an endogenous latent constructs
 An observed variable	X = an observed variable that defines an exogenous latent construct (ξ) λ = lambda, denotes the relationship between X and ξ δ = delta, an error term for an observed variable that defines an exogenous latent construct Y = an observed variable that defines endogenous latent construct (η) γ = gamma, denotes the relationship between Y and η ε = epsilon, an error term for an observed variable that defines a latent endogenous construct (η)

Figure 16: Symbols and Terms used in the Structural Model
(adapted from Jewell, 2003)

was performed using AMOS (Analysis of Moment Structures) software, version 5 (Arbuckle, 2003). Data for AMOS was stored in an SPSS file, and read directly into the AMOS software for model estimation.

A major component of SEM is determining how well the hypothesized model fits the sample data. To determine model fit, several goodness-of-fit (GOF) indices are

typically used. The most common index, the chi-square (χ^2) statistic, measures the degree of discrepancy between the fitted model and the sample observed covariance matrix (Martens, 2005; Sousa & Chen, 2002). The higher the probability associated with χ^2 (a nonsignficant χ^2), the better the fit between the hypothesized model and the perfect fit model (Byrne, 2001). However, χ^2 is sensitive to sample size and violations of multivariate normality. A large sample size (> 200) may lead one to reject the model even though the model may fit the data well (Munro, 2001). Although considerable debate exists regarding the most appropriate GOF indices, it has been recommended to examine multiple indices when determining model fit (Byrne, 2001; Coker, Watkins, Smith, & Brandt, 2003; Martens, 2005). By doing so, weaknesses of certain indices are offset by strengths of other indices.

Table 9 summarizes the GOF indices used in this study to assess model fit. The goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI) and likelihood ratio (χ^2/df) are the most commonly used fit indices, although they are thought to be substantially influenced by sample size and number of indicators per factor. The Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and comparative fit index (CFI) are thought to be much less affected by factors other than model misspecification. Therefore, these latter indices are considered more appropriate indices (Martens, 2005). Hoelters critical N (CN) differs substantially from the other fit indices in that it estimates the adequacy of sample size rather than the fit of the model (Byrne, 2001).

Table 9: GOF Indices Used to Determine Adequacy of Model Fit

Indices	Indicator of good fit
Likelihood Ratio (chi-square/degrees of freedom)	< 5
Goodness-of-fit index (GFI)	> .9
Adjusted GFI (AGFI)	> .9
Root Mean Square Error of approximation (RMSEA)	≤ .05
Tucker-Lewis index (TLI)	> .9
Comparative fit index (CFI)	> .90
Hoelter's critical N (at .05 level) (CN)	> 200

If the GOF statistics indicated an inadequate model fit, model modification strategies were used in an attempt to improve fit provided the respecification had theoretical justification. Areas of misfit or misspecification were determined by assessing parameter estimates, standardized residuals, and modification indices. Parameter estimates (path coefficients) were evaluated for statistical significance. Those parameter estimates with critical values less than ± 1.96 were considered unimportant to the model and subsequently deleted (Byrne, 2001). Standardized residuals represent "estimates of the number of standard deviations the observed residuals are from the zero residuals that would exist if the model fit were perfect" (Byrne, 2001). Values greater than ± 2.58 represented model misspecification. Lastly, modification indices (MI) indicated the expected decrease in chi-squared if a parameter was not constrained. MI's were used to provide clues as to what changes to the model should or could be made (Sharma, 1996). The highest MI's were considered for modification. All modifications were grounded in theory rather than purely data-driven. Otherwise the addition of paths

may result in an improved model yet have little theoretical meaning. Unjustified modifications may result in changes based on the idiosyncrasies of the data set, producing a model that will not apply to future samples (Byrne, 2001). When model respecification occurred, and the respecified model resulted in a nested model, a nested chi-square was used to determine which of the two competing models fit the data significantly better. This was calculated by subtracting the chi-squared value and degrees of freedom for the competing model to obtain a change in chi-squared value (Munro, 2001).

Measures of HRQL

The constructs developed and utilized to measure HRQL were based on conceptualizations presented in the literature (see Chapter 2). Five latent constructs were used to define HRQL: general health perception (GHP), physical functioning (PF), psychological functioning (PsyF), social functioning (SF), and vitality (VT). Each of these constructs, and the variables used to measure these constructs, are discussed in detail in the sections below.

Physical Functioning (PF)

Development of the physical functioning construct was based on the framework put forth by Patrick & Erickson (1993). These researchers conceptualized physical functioning into two domains: activity restrictions and fitness. Activity restrictions refers to limitations in body movements (i.e.: walking, bending), self-care activities (i.e.: bathing, dressing) and mobility (i.e.: confined to bed or chair, assistance needed for traveling). Fitness refers to positive aspects of functioning such as endurance level, speed, and frequency and duration of exercise (Patrick & Erickson, 1993). Descriptive

statistics, variables used to define the construct, as well as the types of measurement scales used in this study are summarized in Table 10.

Table 10: Descriptive Statistics for Physical Functioning Construct

	PF1	PF2	PF3	PF4
Name of variable	Physical functioning scale of SF-36	Difficulty with home mobility	Assist traveling in community	Frequency of exercise/week
Type of measurement scale	continuous	dichotomous †	dichotomous †	continuous
Range	0-100	0 = yes 1=no	0 = yes 1=no	0-7
Mean or %	82.49	0 = 3.9% 1 = 96.1%	0 = 3.9% 0 = 96.1%	5.02
SD	21.06	-	-	2.46
Skewness	-1.61	-	-	-.92
Kurtosis	-.54	-	-	-.54

† indicates variable converted from ordinal to dichotomous

Limitations in bodily movements and self-care activities were determined using the physical functioning scale from the SF-36 (Ware & Sherbourne, 1992). Ten activities were listed and subjects were asked if their current health limited any of the listed activities. Response choices included "yes, a lot (1)", "yes, a little (2)", or "no, not at all (3)". Responses were recoded such that 1 was recoded to 0, 2 was recoded to 50, and 3 was recoded to 100 (RAND Corporation, 2002). The items were then averaged to create a scale score labeled PF1. Therefore, high scores defined a more favorable health state. Cronbach alpha coefficients for the physical functioning subscale has ranged from .88 to

.93 (McDowell & Newell, 1996), indicating acceptable levels of internal consistency. Test-retest reliability (two week interval) for the physical functioning scale has been reported at .81 (n=187) (Brazier et al., 1992).

Two separate items were used to assess home mobility (PF2) and community mobility (PF3). Due to non-normality of the data, both these variables were converted to dichotomous data and recoded as either a yes or no response. For home mobility, a "yes" response indicated that the subject spent at least part of the day in a bed or chair due to health. For community mobility, a "yes" response indicated that the subject required assistance traveling in their community. Problems associated with reducing continuous data to dichotomous data are discussed in Chapter 6.

Level of fitness was assessed by asking subjects the number of times per week they engaged in exercise.

Psychological Functioning (PsyF)

Despite numerous instruments to measure psychological functioning, the dimensions of psychological functioning are not well conceptualized (Kane & Kane, 2000; Ryff & Keyes, 1995). Historically, psychological well-being has been guided by two primary components: degree of happiness and life satisfaction (Ryff & Keyes, 1995). Happiness is defined by Bradburn (1969) as the balance between two dimensions labeled positive affect (PA) and negative affect (NA). Subsequent studies showed these two dimensions to be independent of one another; therefore they should be considered separately (Kane & Kane, 2000; Lawton, Kleban, Dean, Rajagopal, & Parmelee, 1992; Watson & Tellegen, 1985). Life satisfaction was seen to complement happiness and

considered an individual's reflection across multiple and broad domains (Kane & Kane, 2000). More recent work by Ryff and Keyes (1995) have suggested six distinct dimensions of psychological well-being including autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance.

Based on the literature and the available data, this study used four of the domains mentioned above to define psychological functioning: positive affect (PA), negative affect (NA), purpose in life, and life satisfaction. Descriptive statistics, variables used to define the construct, as well as the types of measurement scales used in this study are summarized in Table 11.

Table 11: Descriptive Statistics for Psychological Functioning Construct

	PsyF1	PsyF2	PsyF3	PsyF4
Name of variable	Positive affect	Negative affect	Purpose in life	Life satisfaction
Type of measurement scale	continuous	continuous	continuous	continuous
Range	1.83-5.00	2.83-5.00	2.33-7.00	2.00-10.00
Mean	3.70	4.42	5.77	8.34
SD	.54	.44	1.13	1.57
Skewness	-.79	-.98	-.84	-1.15
Kurtosis	1.03	1.09	-.11	1.37

Positive and negative affect (PsyF1 and PsyF2, respectively) were measured by asking subjects to rate the extent or intensity of emotions in twelve different items. Items were culled from a variety of well known and valid instruments including the Affect

Balance Scale (Bradburn, 1969), the University of Michigan's Composite International Diagnostic Interview (Kessler *et al.*, 1994), the Manifest Anxiety Scale (Taylor, 1953), the Health opinion Survey (MacMillan, 1957), the General Well-Being Schedule (Fazio, 1957), and the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). Six of these items (cheerful, in good spirits, extremely happy, satisfied, full of life, calm and peaceful) represented positive affect, while the remaining six items (so sad nothing could cheer you up, nervous, restless or fidgety, hopeless, that everything was an effort, worthless) represented negative affect. Response choices from both the positive and negative was based on a 5 point likert scale. Responses for positive and negative affect descriptors were averaged separately. Since higher numbers represented higher levels of either affect, negative affect was reverse coded so higher values represented higher levels of psychological functioning. Cronbach's alpha of .87 and .91 have been reported for NA and PA, respectively (Mroczek & Kolarz, 1998).

Purpose in life (PsyF3) attempts to capture an individual's sense of directedness; that is, whether they have goals in life, hold beliefs that give life purpose, feel there is meaning to life, and have aims and objectives for living (Ryff, 1989). Purpose in life was measured using three items (see Appendix A). Responses were based on a 7 point likert scale. Questions two and three were reverse coded so higher numbers represented higher levels of psychological functioning. The average of the three items was used for data analysis. Research has demonstrated alpha coefficients for this scale to be .90 (Ryff, 1989).

Life satisfaction (PsyF4) was measured with a single-item indicator. Subjects were asked to rate their life at the present time on a scale of 1 to 10, with 1 being the worst possible life imaginable and 10 being the best possible life imaginable.

Social Functioning (SF)

Unlike physical and psychological functioning, social functioning does not have well-established assessment tools, nor are there simple conceptual models of social functioning (Cutrona & Russell, 1987; Levin, 2000). The lack of conceptualization is due to the multidimensionality of the construct and the considerable overlap that exists between dimensions of the construct.

Kane and Kane (2000) proposed five domains of social functioning: social support, social networks, social resources, social roles and role functioning, and social activities. These five domains are summarized in Table 12. This study used data to assess three of the five domains (social support, social networks, and social activities).

Table 12: Assessment of the Social Functioning Domains

Domain	Definition
Social Support	Assistance provided through ones social networks; can be actual or perceived support
Social Networks	Individuals and services, both formal and informal, that provide support; reciprocity of relationships
Social Resources	Tangible available resources including financial, housing, and community resources
Social Roles and Role Functioning	Behaviors associated with positions within an organization of a group (i.e.: mentor, grandparent, retiree, widow, dependent, care provider, spouse, parent, member of a particular group
Social Activities	Activities providing social stimulation and involvement (i.e.: present or former occupation, leisure activities, religiosity, participation in volunteer work or social clubs, entertainment)

Social resources was not assessed as it is typically not included in geriatric assessment tools (Kane, 1995). In addition, income (a social resource) was subsumed under socioeconomic status as a factor influencing HRQL. Likewise, social roles and role functioning, specifically marital status, was treated as an observed variable influencing HRQL.

Table 13 contains a descriptive analysis of the observed variables used to define the construct of social functioning.

Table 13: Descriptive Statistics for Social Functioning

	SF1	SF2	SF3	SFF4	SF5	SF6	SF7	SF8
Name of variable	Cutrona Scale– Attachment	Cutrona Scale– Social integration	Cutrona Scale– reliable alliance	Cutrona Scale– Social support	Instrumental Support– Get help	Instrumental Support– Give help	Volunteer Hours/ Month	Paid Employment hours/ month
Type of measure-ment scale	continuous	continuous	continuous	continuous	continuous	continuous	dichotomous†	dichotomous†
Range	1.00-4.00	2.25-4.00	2.50-4.00	1.75-4.00	1.00-9.00	0.00-9.00	0=no vol. 1=vol.	0=not emp. 1=emp.
Mean or %	3.36	3.29	3.48	3.36	6.76	6.71	0 = 40.8% 1 = 59.2%	0=85.7% 1=14.3%
SD	1.57	.42	.43	.46	1.98	1.95	-	-
Skewness	-1.15	.30	.03	.11	-.67	-.79	-	-
Kurtosis	1.37	-.91	-1.61	-.84	-.39	-.29	-	-

† converted from continuous to dichotomous datasubscales utilized.

The Cutrona Social Provisions scale (Cutrona & Russell, 1987) was designed to study the relationship between social support and health. The scale consisted of six subscales, four of which were used in this study: attachment (SF1), social integration (SF2), reliable alliance (SF3), and guidance (SF4).

Table 14 defines each of the four subscales utilized. Each subscale was assessed with four items, two that described the presence, and two that described the absence of the provision. Response choices for each item in each subscale was based on a 4 point likert scale. Negative items were reversed coded. Values were summed and averaged to form a score for each social provision. Literature has demonstrated that the subscale measures of the Social Provisions scale are reliable. Alpha coefficients for the four subscales range from .65 to .75 (Cutrona & Russell, 1987). Issues regarding low to moderate alpha coefficient values are discussed in Chapter 6.

Table 14: Subscales and Definitions of the Social Provisions Scale (Cutrona, Russell, & Rose, 1986)

Subscale	Definition
Social Integration	"A sense of belonging to a group of people who share common interests and recreational activities, usually obtained from friends".
Guidance	"Advice and information, usually obtained from teachers, mentors, or parent figures".
Reliable Alliance	"The assurance that one can count on others for assistance under any circumstances, usually obtained from family members".
Attachment	"A sense of emotional closeness and security, usually provided by a spouse or lover".

The Instrumental Support Scale was used to measure the dimension of social networks. This tool measures the availability of the respondent to both give help (SF5) and receive help (SF6) from family and friends. For each instrumental support scale, subjects were asked to respond to nine items by answering either "if needed", "yes" or "no". The number of times the subject answered with either "if needed" or "yes" were

summated and used in data analysis. Reliability of the Instrumental Support Scale has not been reported in the literature.

To determine the extent of involvement with social activities, the amount of volunteer work (SF7) and paid employment (SF8) were determined. For volunteer work, subjects were asked to state the number of hours/month they volunteered in their community. To determine the amount of paid employment, subjects were asked to state the number of hours/week they worked for pay. Although religiousity could be considered a social activity, religion was treated as a separate construct influencing HRQL, as measurement tools do not typically consider religion as part of HRQL. Both volunteer work and paid employment hours did not meet the assumptions of normality and were converted to categorical data. Coding was based on whether or not subjects engaged in volunteer work or paid employment. Problems associated with reducing data from continuous to dichotomous are discussed in Chapter 6.

General Health Perceptions (GHP)

General health perceptions (GHP) refers to an individual's self-rating of health. Self-rating of one's health does not focus on a specific dimension of health such as physical, psychological or social health (Baron-Epel & Kaplan, 2001). Rather, rating of one's health is thought to summarize the way in which various aspects of health interact with one's own perceptual framework (Kaplan & Baron-Epel, 2003; Svedberg, Lichtenstein, & Pedersen, 2001). Therefore, GHP was treated in this study as a separate construct. Descriptive statistics, variables used to define the construct, as well as the types of measurements scales used in this study are summarized in Table 15.

Table 15: Descriptive Statistics for General Health Perception

	GHP1	GHP2
Name of variable	Health rating	Health compared to others
Type of measurement scale	continuous	dichotomous†
Range	0.00-10.00	0 = poor, fair 1 = good, excellent
Mean or %	7.73	0 = 12.1% 1 = 87.9%
SD	1.86	-
Skewness	-1.23	-
Kurtosis	1.75	-

† indicates variable converted from ordinal to dichotomous

Research has shown that responses to questions regarding GHP vary depending on the wording used to elicit the response (Baron-Epel & Kaplan, 2001; Idler, 1992). Therefore, two indicators were used to measure GHP: a general question on self-perceived health (GHP1) and an age-related question on self-perceived health (GHP2). For GHP1, subjects were presented with a picture of a ladder with rungs numbered from 0 (bottom rung) to 10 (top rung). Subjects were then asked to indicate which rung represented their current health status. For the age-related question, subjects were asked to compare their health to others their own age. Since responses to this question were based on a 4 point likert scale, the measure was converted to a dichotomous variable.

Few studies have examined the reliability of single-item general health perception questions. However, most researchers consider self-rating of ones health a valid and

reliable indicator of overall health status (Baron-Epel & Kaplan, 2001; Ferraro, Farmer, & Wybraniec, 1997; LaRue, Bank, Jarvik, & Hetland, 1979). The ladder scale used in this study is derived from the ladder scale proposed by Cantril (Cantril, 1966). Aside from general health perceptions, the ladder scale has been used to measure other single-item indicators of well-being such as life satisfaction. Two-year test-retest reliability in a community sample has been reported at .40 when using the ladder scale to measure life satisfaction (Atkinson, 1982). Issues regarding reliability are discussed in Chapter 6.

Vitality

Vitality represents the positive and negative ends of the energy/fatigue continuum (Sousa & Chen, 2002). Vitality was measured using two items: quality of sleep and energy levels. Variables used to define the construct, their descriptive statistics, as well as the types of measurements scales used in this study are summarized in Table 16.

Table 16: Descriptive Statistics for Vitality

	VT1	VT2
Name of variable	Quality of sleep	Amount of pep or energy
Type of measurement scale	dichotomous†	Continuous
Range	0 = poorly, not very well 1 = fairly well, well	0-10
Mean or %	0 = 14.9% 1 = 85.1%	7.07
SD	-	1.73
Skewness	-	-.681
Kurtosis	-	.970

† indicates variable converted from ordinal to dichotomous

Quality of sleep was based on a 4 point likert scale and therefore converted to dichotomous data. To assess energy levels, subjects were presented with a 10 step ladder and asked which step on the ladder indicated their amount of pep or energy.

HRQL Measurement Model

The initial HRQL measurement model (Figure 17) was represented by a second-order structure, consisting of one higher second order factor (HRQL) and five lower first order factors (GHP, PF, PsyF, SF, VT). The single-headed arrows leading from HRQL to each of the first order factors represented regression paths that indicated the prediction of GHP, PF, PsyF, SF, and VT from an HRQL factor; they represented the second-order factor loadings. Each observed variable was linked to one of five first order factors, and these linkages represented regression paths that indicated the prediction of each item from one of its corresponding first-order factors. The single headed arrow pointing to each observed variable represented observed measurement error associated with the observed variable. The arrow leading to each first order factor represented residual error in the prediction of factors from the higher order factor of HRQL. For each first order factor, one of the paths used to define the factor was constrained to a value of one. The variable constrained to one was considered the reference variable (Munro, 2001). In order to have an over-identified model (i.e.: the number of estimable parameters is less than the number of data points), the variance of the second order factor, HRQL, was constrained to one. This ensured that the higher portion of the model (second order) resulted in positive degrees of freedom, rendering the model useful (Byrne, 2001).

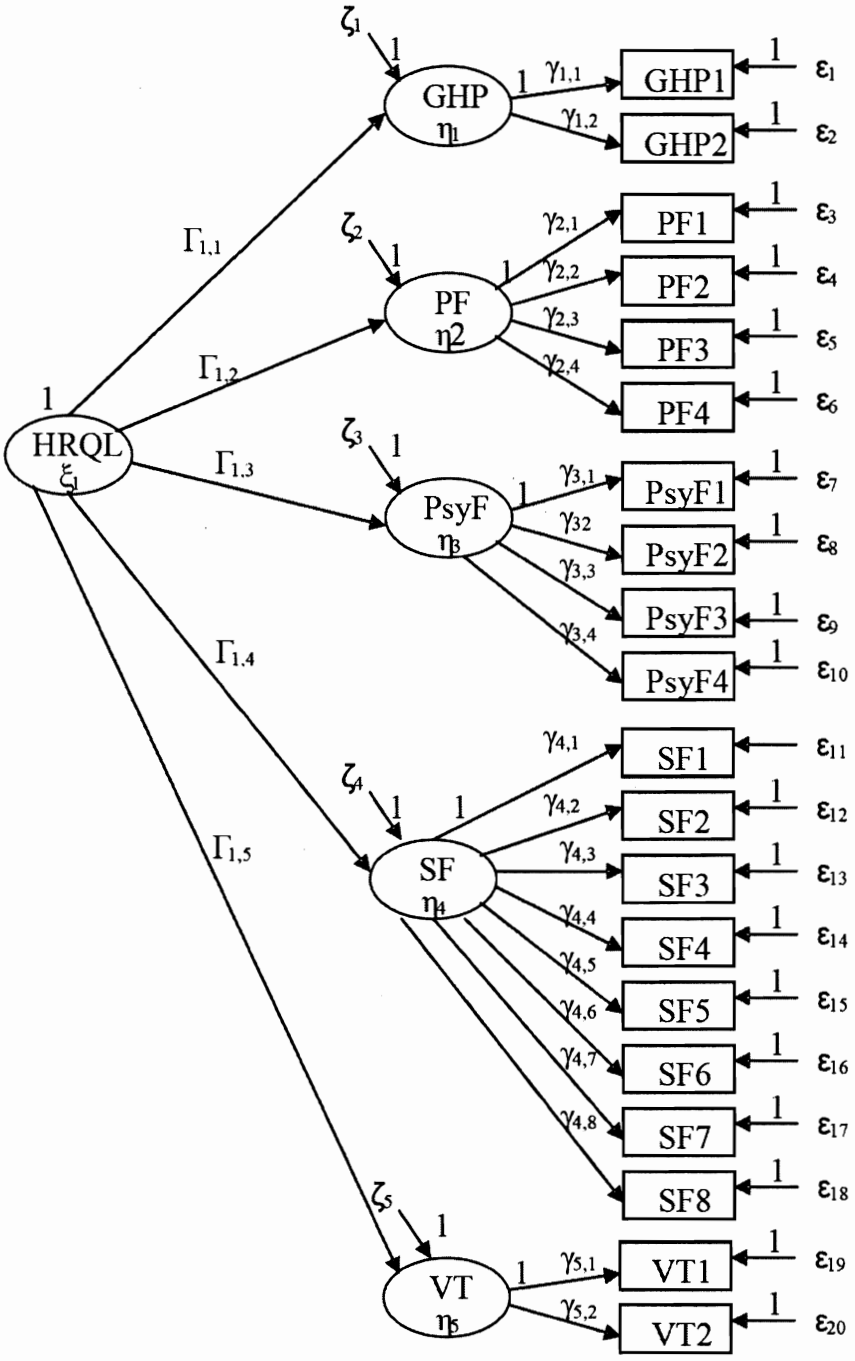


Figure 17: Initial Measurement Model of HRQL.
GHP=general health perceptions, PF = physical functioning, PsyF = psychological functioning, SF = social functioning, VT = vitality.

Validation of the HRQL Measurement Model

As indicated by the goodness-of-fit statistics for the initial model (Table 17), model fit was not optimum. Furthermore, vitality had a negative variance, leading to a solution that was not admissible. Negative variance of a latent variable is termed a "Heywood" case, indicating either misspecification of the model, presence of outliers in the data, high multicollinearity, or having only two indicators per latent variable (Bollen, 1989). Therefore, vitality was deleted from the model. This is the most common method of handling a negative variance (Garson, 2005). Once vitality was removed from the model, an admissible solution was possible (model 2). GOF statistics, however, did not reveal a better fitting model.

Table 17: GOF Indices for Measurement Models of HRQL

Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN (.05)
1. Initial	2.739 (p=.000)	.898	.870	.069	.877	.858	157
2. Vitality removed	3.067 (p=.000)	.899	.868	.076	.869	.847	144
3. SF5, SF8 removed	2.484 (p=.000)	.924	.896	.064	.924	.909	182
4. SF6 removed	2.335 (p=.000)	.933	.907	.061	.940	.927	196
5. ε12 ↔ ε14 correlated	2.155 (p=.000)	.939	.914	.056	.949	.937	213
6. ε7 ↔ ε9 correlated	2.040 (p=.000)	.943	.918	.054	.954	.943	225
7. ε4 ↔ ε5 correlated	1.948 (p=.000)	.945	.921	.051	.959	.948	236
8. ε2 ↔ ε7 correlated	1.876 (p=.000)	.948	.924	.049	.962	.952	246

A review of parameter estimates of the initial model (Table 18) indicated non significant parameter estimates (critical ratio ≤ 1.96) for SF5 and SF8. These observed

Table 18: Standardized Parameter Estimates for Initial Measurement Model of HRQL

	Standardized Parameter Estimates (critical ratios*)				
	GHP	PF	PsyF	SF	VT
GHP1**	.934				
GHP2	.610 (10.03)				
PF1**		.855			
PF2		.494 (7.45)			
PF3		.406 (6.59)			
PF4		.336 (5.42)			
PsyF1**			.781		
PsyF2			.512 (7.96)		
PsyF3			.150 (2.48)		
PsyF4			.707 (9.51)		
SF1**				.901	
SF2				.818 (21.38)	
SF3				.858 (23.61)	
SF4				.904 (26.44)	
SF5				.050 (.735)	
SF6				.107 (1.99)	
SF7				.136 (2.52)	
SF8				-.024 (-.45)	
VT1**					.335
VT2					.751 (5.76)

Γ values

HRQL → GHP = .833

HRQL → PF = .664

HRQL → PsyF = .540

HRQL → SF = .126

HRQL → VT = 1.064

*critical ratio values > 1.96 indicate statistical significance ($p < .05$). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

variables were deleted from the model yielding a better fitting model (model 3). However, with this revision, the parameter estimate for SF6 was non significant and therefore deleted from the model. The intent of SF5 (instrumental support-getting help from others) and SF6 (instrumental support-giving help to others) was to measure the degree of social networks, a domain of social functioning (Kane & Kane, 2000). Instrumental support is a subscale in the Duke Social Support Index (George, Blazer, Hughes, & Fowler, 1989). No reports of reliability of this subscale in the literature were found. In isolation, the instrumental support subscale may not have been a reliable or sufficient measure of social networks. SF8 (hours/month of paid employment) was converted to a dichotomous scale due to non-normality of the data. The uneven split between the categories (Table 13) may have contributed to problems with using this data with a multivariate analysis (Tabachnick & Fidell, 1996).

Once non-significant parameters were removed from the model (model 4), GOF indices resulted in a reasonably well fitting model. However, standardized residual covariance's (> 2.58) indicated areas of misspecification. Specifically, high modification indices were present for the association between the observed variable PsyF3 (purpose in life) and the latent construct SF. Statistically, this problem could have been corrected by cross-loading PsyF3 onto the latent variable SF (cross loadings represent the simultaneous loading of an item on more than one factor). Theoretically, PsyF3 (purpose in life) did not fit into any of the social functioning domains. Therefore, cross-loading was not theoretically justified and was not added to the model.

The last strategy used to improve model fit was examination of modification indices (MI's) of the covariances among the error terms. Causes of correlated error may be due to redundancy in item content, or methods bias (i.e.: a bias in answering an item may result in a similar bias in answering a different item) (Garson, 2005) Although there were several error correlations that could have been theoretically justified (Table 19), for the sake of parsimony, only those with the highest MI's were considered. Correlated error terms were made one at a time (models 5 – 8) since MI's are estimates that will change with each additional step. Error terms that were correlated in the final model

Table 19: Plausible Correlated Error Terms

Correlated terms		Question	Hypothesized basis for justification
ε1	(GHP1)	Health rating	Methods bias
ε3	(PF1)	Physical functioning (SF36)	
ε1	(GHP1)	Health rating	Methods bias
ε6	(PF4)	Frequency of exercise	
ε2	(GHP2)	Health compared to others	Methods bias
ε7	(PsyF1)	Positive affect	
ε4	(PF2)	In bed most of day	Redundancy in item
ε5	(PF3)	Need assist in traveling	
ε7	(PsyF1)	Positive affect	Methods bias
ε9	(PsyF3)	Purpose in life	
ε8	(PsyF2)	Negative affect	Methods bias
ε10	(PsyF4)	Life satisfaction	
ε9	(PsyF3)	Purpose in life	Methods bias
ε10	(PsyF4)	Life satisfaction	
ε11	(SF1)	Attachment	Methods bias
ε13	(SF3)	Reliable alliance	
ε12	(SF2)	Social integration	Methods bias
ε13	(SF3)	Reliable alliance	
ε12	(SF2)	Social integration	Methods bias
ε14	(SF4)	Social support	
ε12	(SF2)	Social integration	Methods bias
ε17	(SF7)	Volunteer work	

included ε2 ↔ ε7, ε4 ↔ ε5, ε7 ↔ ε9, and ε12 ↔ ε14. Change in χ^2 revealed a significant difference between models 4 and 5 ($\Delta\chi^2 = 17.609$; $\Delta df = 1$), models 5 and 6 ($\Delta\chi^2 = 11.844$; $\Delta df = 1$), models 6 and 7 ($\Delta\chi^2 = 9.687$; $\Delta df = 1$), and models 7 and 8 ($\Delta\chi^2 = 7.818$; $\Delta df = 1$). Although model 8 could have been improved by further correlation of error terms, GOF statistics indicated a well fitting model. Additionally, further correlations were not theoretically justified. Therefore, for statistical and theoretical reasons, model 8 was considered to be the most plausible and parsimonious model of HRQL. This final model along with standardized parameter estimates are presented in Figure 18 and Table 20.

Parameter estimates for the first order constructs on the second order construct, HRQL, ranged from .15 to .96. GHP was the predominant first order construct that defined HRQL with a coefficient of .96. With the exception of SF, the remaining first order constructs had coefficients equal or greater to .5, indicating that the constructs adequately defined HRQL (T. Wan, 2002). SF was retained in the model since SF is typically considered an important component of HRQL.

Measure of Factors Influencing HRQL

Once the HRQL measurement model was validated, the individual constructs hypothesized to influence HRQL were described and modeled. This section describes the variables used to measure the constructs hypothesized to influence HRQL. Following the description of each construct, the results of the confirmatory factor analysis to confirm the structure of the measurement model for the construct are provided. The results of the full structural model are presented in Chapter 5.

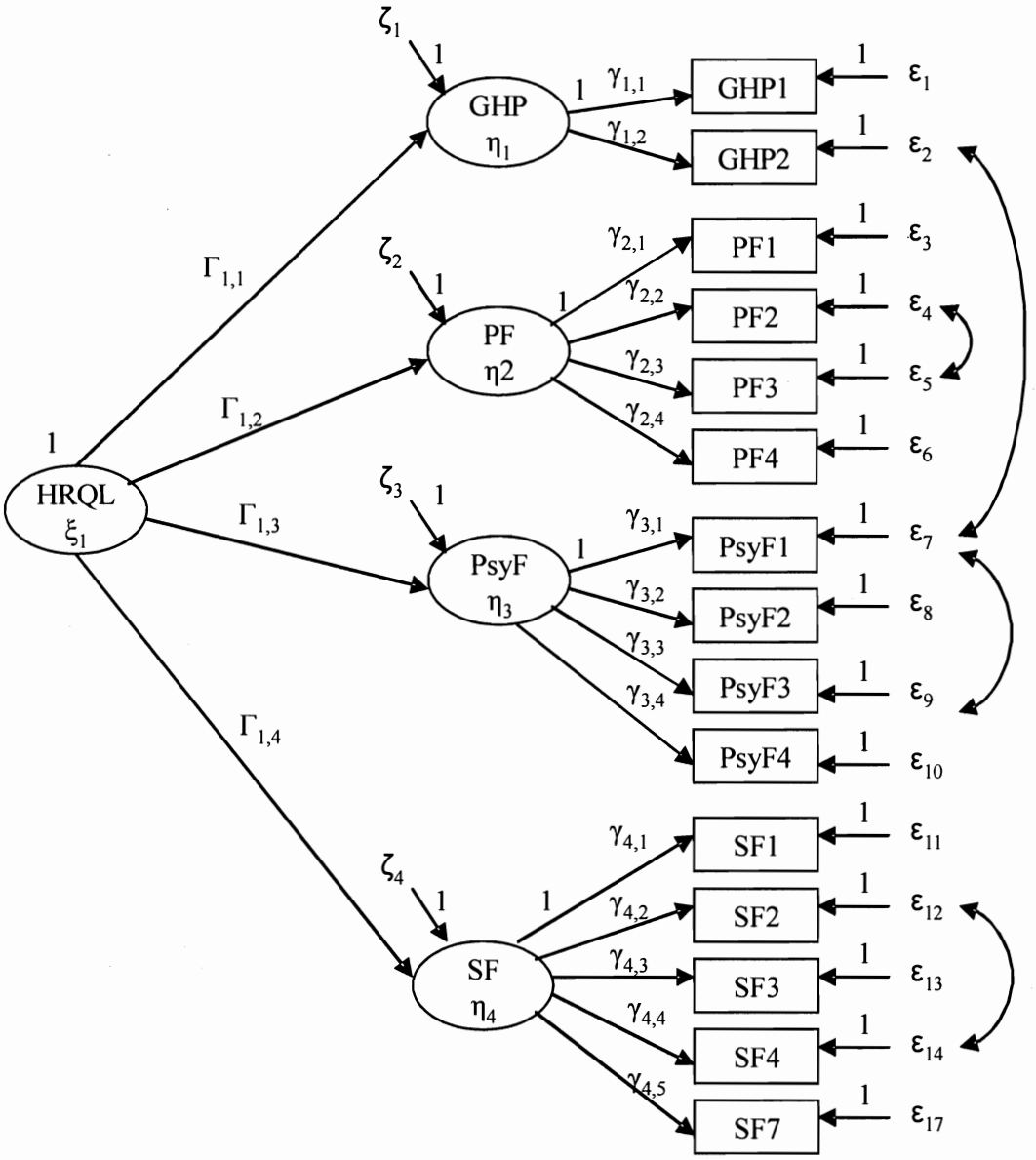


Figure 18: Final Measurement Model of HRQL.
GHP=general health perceptions, PF = physical functioning, PsyF = psychological functioning, SF = social functioning.

Table 20: Standardized Parameter Estimates for Final Measurement Model of HRQL

Standardized Parameter Estimates (critical ratios*)				
	GHP	PF	PsyF	SF
GHP1**	.869			
GHP2	.649 (8.75)			
PF1**		.875		
PF2		.470 (6.47)		
PF3		.385 (5.62)		
PF4		.332 (5.12)		
PsyF1**			.821	
PsyF2			.492 (7.55)	
PsyF3			.245 (3.45)	
PsyF4			.685 (8.97)	
SF1**				.892
SF2				.853 (21.30)
SF3				.850 (23.04)
SF4				.929 (25.65)
SF7				.135 (2.53)

Γ values:

HRQL → GHP = .963

HRQL → PF = .630

HRQL → PsyF = .468

HRQL → SF = .147

*critical ratio values > 1.96 indicate statistical significance ($p < .05$). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

Medical Burden (MB)

Early literature used the term "objective health" to refer to the actual state of one's physical health. Examples of objective health indicators have included number of days spent in bed, number of days spent in the hospital, number of physician visits, number of medications currently prescribed, and number of chronic conditions (Borawski, Kinney, & Kahana, 1996; Linn & Linn, 1980). Later literature used the term "subjective health" to refer to an individual's self-evaluation of his or her health status (Baron-Epel & Kaplan, 2001; Kaplan & Baron-Epel, 2003). To avoid confusion surrounding the terms "objective" and "subjective" measurements, this study will use the term medical burden (MB) to refer to measures previously termed "objective health".

Physiological measures of health form the basis of all medical evaluations (Kane & Kane, 2000). Although many of these evaluations require laboratory tests and physical examination, information regarding one's medical burden (MB) may also be gained from patient report. However, patient reported measures used to gain information about MB vary considerably in the literature. Conceptually, the single indicator that has traditionally been used to measure MB is the number of chronic conditions (Borawski, Kinney, & Kahana, 1996). Other commonly used measures include prior health care utilization, medications taken, pain, and disability days (Kane & Kane, 2000; Linn & Linn, 1980; Stoller, 1984). Based on the literature and the available data, number of illnesses, health care utilization, and number of medications prescribed were used to measure MB. Observed variables and measurement scales used to develop the MB construct, as well as descriptive statistics are summarized in Table 21.

Table 21: Descriptive Statistics for Medical Burden (MB)

	MB1	MB2	MB3	MB4	MB5
Name of variable	# illnesses	Out of pocket medical expenditures	# overnights spent in hospital, nursing home, or respite	# times spoke with MD, nurse, specialist, other health care provider	# medications prescribed
Type of measurement scale	Continuous	Dichotomous †	Dichotomous †	Dichotomous †	Continuous
Range	0 - 9	0 = $0 – $1200 1 = $1201 – highest	0 = no days spent 1 = spent at least 1 day	0 = 0–12 times 1 = 13 or more times	0 – 6
Mean or %	2.33	0 = 76.3% 1 = 23.7%	0 = 78.0% 1 = 22.9%	0 = 69.7% 1 = 30.3%	1.51
SD	1.66	-	-	-	1.23
Skewness	.70	-	-	-	.86
Kurtosis	.43	-	-	-	.80

† converted from continuous to dichotomous data

To determine number of chronic conditions, subjects were given a list of 34 illnesses (Table 22) and asked to indicate those illnesses that were diagnosed in the past 2 years. To determine any other health problems, the subjects were given the same list and asked to indicate other illnesses they had at the time of the interview. All subjects had at least a 3 month duration for each illness reported. Using this length of time to define chronic condition is supported by Perrin et al (1993). With the exception of the "other" category, the total number of chronic and current illnesses was summated.

Three separate items were used to measure health care utilization: total out-of-pocket medical expenditures in the last year, total number of overnight stays in a hospital, nursing home, or respite care in the past 2 years, and the total number times the subject

Table 22: List of Illness/Injury Categories

1.	Cancer/leukemia	18.	Prostate
2.	Hypertension	19.	Depression
3.	Heart disease/attack	20.	Eye disease
4.	Stroke	21.	Hernia
5.	Cholesterol	22.	Memory loss
6.	Circulatory problems	23.	Kidney
7.	Autoimmune disease	24.	Liver
8.	Asthma	25.	Gall bladder
9.	Bronchitis	26.	Musculoskeletal
10.	Emphysema	27.	Neurological
11.	Diabetes	28.	Stomach
12.	Broken bone/fracture	29.	Intestinal
13.	Joint replacement	30.	Thyroid
14.	Osteoporosis	31.	Uterine
15.	Arthritis/rheumatism	32.	Allergies
16.	Back condition	33.	Skin
17.	Urinary condition	34.	Other (specify)

spoke with an MD, nurse, specialist or other health care provider in the past year. All three items demonstrated non-normality and were therefore converted to dichotomous data.

According to various sources, out-of-pocket medical expenditures in older Americans average from approximately $1200 to $2000 per year depending on age, insurance coverage, and health (Goldman & Zissimopoulos, 2003; Harman, Kelleher, Reynolds, & Pincus, 2004; Langa et al., 2004; Stewart, 2004). Since the majority of subjects (74%) had out-of-pocket expenditures at the estimated lower range or less, out-

of-pocket medical expenditures was dichotomized into those spending $\leq$ $1200, and those spending > $1200.

Number of medications taken was determined by first asking the subject if they were taking any prescribed medications. If they answered yes, they were asked what the medication was for. These medications were then summated. However, by virtue of how the question was worded, if the individual was taking more than one drug for a given problem, this data was not captured.

No literature was found that reported the average number of contacts with a health professional in a given year. Twelve contacts was used as a cut-off since 13.2 contact represented the average number of contacts in the study sample. Therefore, total number of times the subject spoke with a health care professional was dichotomized into $\leq$ 12 times and $\geq$ 13 times.

Validation of Measurement Model: Medical Burden (MB)

Medical Burden (MB) referred to patient's self-report regarding medical health. Figures 19a and b depict the initial and final measurement model for MB. Although parameter estimates were significant (Table 23), goodness of fit indices of the initial model suggested less than optimum fit (Table 24). Several correlations of error terms made theoretical sense. However, for the sake of parsimony, only correlation errors that were theoretically justified and had the highest MI's were considered. This resulted in correlation of error terms e2 (total out-of-pocket medical expenses) and e4 (Total number of contacts with a health provider) (Harman, Kelleher, Reynolds, & Pincus, 2004; Stewart, 2004). This resulted in a well fitting model that was significantly different from

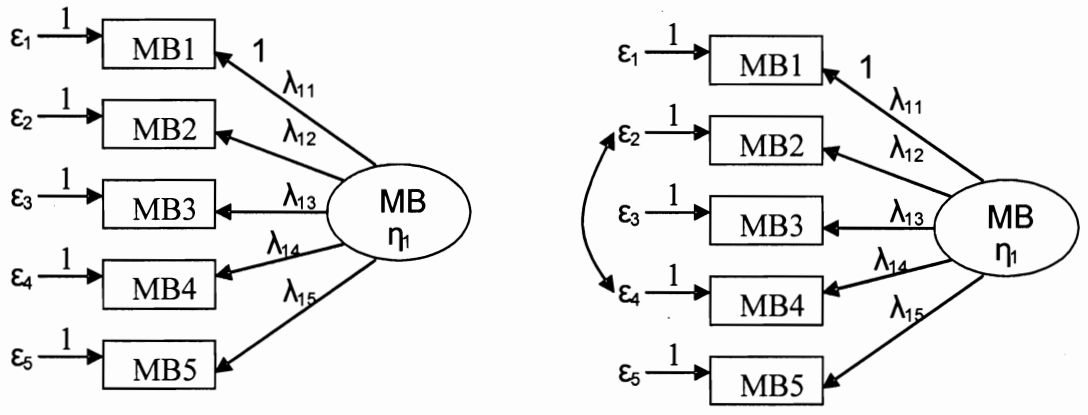


Figure 19 a and b: Initial and Final Measurement Model of MB

Table 23: Initial and Final Measurement Model for MB

	Initial model		Final Model	
	Standardized Estimate	Critical Ratio*	Standardized Estimate	Critical Ratio*
MB1**	.972		.977	
MB2	.196	3.60	.192	3.52
MB3	.348	6.19	.345	6.08
MB4	.354	6.28	.350	6.16
MB5	.782	11.44	.778	10.94
Correlation estimate				
e2 ↔ e4 = .206				

*critical ratio values > 1.96 indicate statistical significance ($p < .05$). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

Table 24: GOF Indices for MB

	Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
1.	initial	5.755 (p = .000)	.969	.907	.115	.945	.890	140
2.	e2 and e4 correlated	3.292 (p=.010)	.986	.948	.080	.979	.947	261

model 1 ($\Delta\chi^2 = 15.51$; $\Delta df = 1$) and met the criteria for all GOF indices with the exception of RMSEA. However, several researchers have indicated that RMSEA values as high as .08 indicate a good fit (Byrne, 2001). Although MI's suggested further error measurement correlation, these changes were not warranted. Therefore, model 2 was considered the final model.

Parameter estimates for the final MB model ranged from .19 to .98. MB1, the number of chronic illnesses, was the predominant variable that defined the construct with a coefficient of .97. Wan (2002), suggests that standardized parameter estimates greater than .5 indicate variables that adequately define the construct. Only one other variable, number of medications taken (MB5), had a coefficient greater than .5. However, variables with coefficients less than .5 were retained in the model since these variables are frequently used to gain information regarding degree of patient's medical burden. A possible reason for low parameter estimates may have been because all three variables with low estimates (MB2, MB3, MB4) relied on the subjects ability to recall specific events or expenditures that occurred within the year or past two years. These variables showed non-normality and were transformed from continuous to dichotomous data to

meet the statistical assumptions for normality. These transformations most likely resulted in a reduction in the ability to differentiate small differences between subjects.

Religious/Spiritual Functioning (RSpF)

Spirituality and religiousness are complex phenomena, which have created difficulty in operationally defining these terms. According to several researchers (Hill & Pargament, 2003; P. Marler & C. Hadaway, 2002; P. L. Marler & C. K. Hadaway, 2002; Miller & Thoresen, 2003), spirituality and religiousness can be described as latent constructs that are independent from one another, yet overlapping. To date, many studies, have treated these terms as the same general concept (Daaleman, Perera, & Studenski, 2004; Idler et al., 2003; Mueller, Plevak, & Rummans, 2001; Thoresen & Harris, 2002). The current study also grouped these terms together to form one construct, religious/spiritual functioning (RSpF).

Religiousness is defined as one's religious practice behaviors, such as attendance at religious worship events and participation in religious organizations. In this regard, religion can be viewed as a social phenomenon (Thoresen, 1998). Religiousness can also be conceptualized as an individual phenomenon. For example, individuals may describe themselves as being religious, indicating that they adhere to some religious belief or practice (Miller & Thoresen, 2003). Spirituality, on the other hand, refers to one's quest for meaning, which may or may not involve religion (Olson & Kane, 2000). Similar to some aspects of religiousness, spirituality can be considered more of a private, individual phenomenon.

To capture both the social and individual aspects of RSpF, three items were used: attendance at religious events, frequency of watching religious events on television, and importance of religious or spiritual beliefs. These variables, along with descriptive statistics, are summarized in Table 25. Since all three questions had responses on a 4 point ordinal scale, these variables were converted to dichotomous data. Problems associated with reducing data to dichotomous are discussed in Chapter 6.

Table 25: Descriptive Statistics for RSpF Construct

	RSpF1	RspF2	RspF3
Name of variable	Frequency of attending religious services	Frequency of watching religious services on TV	Importance of religious or spiritual beliefs
Type of measurement scale	dichotomous †	dichotomous †	dichotomous †
Range	0 = does not attend 1 = attends holidays, 1x/month, 2x/month, 1x/week or more	0 = does not watch 1 = watches holidays, 1x/month, 2x/month, 1x/week or more	0 = not important 1=a little, moderately, or very important
%	0 = 42.7% 1 = 57.3%	0 = 86.0% 1 = 14.0%	0 = 8.3% 1 = 91.7%

† indicates variable converted from ordinal to dichotomous

Religious/Spiritual functioning (RSpF) measured one's religious practice behaviors, as well as the individual's perception of their spirituality. Figure 20 depicts the measurement model for RSpF. Since the initial model only had three indicators for the latent variable, the model was under-identified. Under-identified models indicate that the number of parameters to be estimated exceeds the number of actual data points; hence, the model does not contain sufficient information to obtain a solution (Byrne, 2001). Under-identified models necessitate an additional constraint. Equality constraints

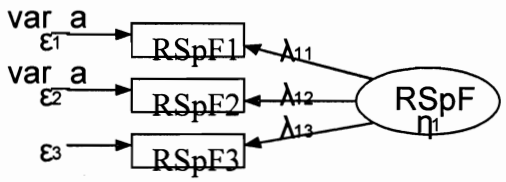


Figure 20: Measurement Model for RSpFValidation of Measurement Model: Religious/Spiritual Functioning (RSpF)

(var_a) were applied to the error terms for RSpF 1 and RSpF 2 since the same scale was used to measure both variables. By applying equality constraints, the two error covariances were assumed to be equal, allowing for an additional degree of freedom and an over-identified model. GOF statistics indicated a poor fit (Table 26). In addition, results indicated a non significant and negative parameter estimate for RSpF2 (Table 27). Because a negative parameter estimate did not make theoretical sense, it was assumed

Table 26: GOF Indices for RSpF

Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
1. Equality constraints	14.214 (p = .000)	.975	.850	.191	1.000	.753	98

Table 27: Initial Measurement Model for RSpF

	Standardized Estimate	Critical Ratio*
RSpF1**	.721	
RSpF2	-.082	-1.178
RSpF3	.441	5.430

*critical ratio values > 1.96 indicate statistical significance (p < .05). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

there was a problem with the development of the construct. This resulted in dropping RSpF2 from the measurement model. Because the model needed to have at least three variables to be over-identified, it became necessary to eliminate the construct. In the full structural model, the RSpF construct was replaced by the single observed variable, RSpF3 (the importance of religious or spiritual beliefs). This variable was considered over the other variables for two reasons. First, RSpF3 was the only variable to specifically address spirituality. Second, RSpF3 did not depend on mobility or visual impairments that might have impeded either attendance at religious services or watching religious services on television.

Housing Satisfaction (HS)

Literature indicates that individual behaviors are influenced by physical, social, and psychological dimensions of the environment (Lawton & Nahemow, 1973). A fourth dimension, cultural environment has also been suggested by some researchers to influence individual behavior (Kane & Kane, 2000). The physical environment (or microenvironment) refers to physical features of the home such as furniture, lighting, handrails, and door width. The psychological environment, often difficult to measure, includes sensory stimuli, preferences, and reactions. The social environment (or macroenvironment) refers to the degree of interaction the individual has with the environment such as the degree of privacy and neighborhood location. Cultural environment refers to traditions, values and norms typically found in residential adult-living settings.

For this study, the adequacy of housing was determined by measuring satisfaction with physical and social environmental factors. This included satisfaction with degree of privacy (social environment), neighborhood satisfaction (social environment), satisfaction with physical aspects of the home (physical environment), home satisfaction (general scale measuring multiple domains of HS), and a single item question regarding overall residential satisfaction. Limitations of using housing satisfaction rather than the actual housing conditions are addressed in Chapter 6. With the exception of the Neighborhood Satisfaction Scale, psychometric properties of the HS scales are not reported in the literature. A summary of these five measures are presented in Table 28.

Table 28: Descriptive Statistics for HS

	HS1	HS2	HS3	HS4	HS5
Name of variable	Home satisfaction	Privacy satisfaction	Neighborhood satisfaction	Residential (overall) satisfaction	Satisfaction with living environment
Type of measurement scale	Continuous	Continuous	Continuous	Continuous	Continuous
Range	2.33 - 4.00	1.75 – 4.00	2.38 – 4.00	20 -100	2.13 – 4.00
Mean	3.45	3.43	3.18	89.27	3.14
SD	.44	.45	.37	14.07	.41
Skewness	-.13	-.27	.71	-1.58	.56
Kurtosis	-.27	-.65	-.17	2.46	-.31

HS1, HS2, and HS5 had multi-item measures that were based on 4 point likert scale. Responses for each item were averaged. Neighborhood satisfaction (HS3) was a

scale developed from previous neighborhood scales, and was determined by averaging the responses to eight items. The neighborhood satisfaction scale has a reported cronbach alpha coefficient of .75 (Evans, 2004). To determine overall satisfaction (HS4), subjects were asked to rate their percent satisfaction based on what they paid for their housing.

Validation of Measurement Model: Housing Satisfaction (HS)

Housing satisfaction referred to one's satisfaction with the physical and social aspects of the environment. Figure 21 a and b depict the initial and final measurement model for housing satisfaction. With the exception of RMSEA, GOF indices for the initial model (Table 29) revealed a well-fitting model with all parameter estimates

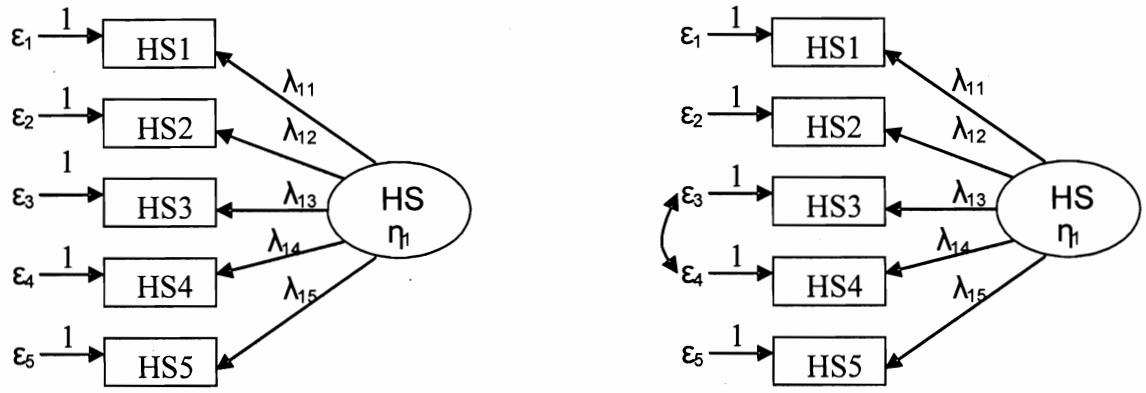


Figure 21 a and b: Initial and Final Measurement Model for HS

Table 29: GOF Indices for HS

	Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
1.	initial	3.565 (p = .003)	.979	.938	.084	.970	.940	225
2.	e3 and e4 correlated	1.998 (p = .092)	.991	.966	.053	.991	.977	430

significant (p <.05) (Table 30). Although modification indices suggested correlating e3 to e4 and e3 to e5, the only correlation that had theoretical justification was e3 (neighborhood satisfaction) to e4 (residential satisfaction)(Jirovec, Jirovec, & Bosse, 1984; Lawton, Nahemow, & Teaff, 1975). This correlation (model 2) resulted in a significant improvement of fit over model 1 ($\Delta\chi^2 = 9.835$; $\Delta df = 1$) and was therefore considered the final model.

Table 30: Initial and Final Measurement Model for HS

	Initial Model		Final Model	
	Standardized Estimate	Critical Ratio*	Standardized Estimate	Critical Ratio*
HS1**	.811		.815	
HS2	.757	12.65	.760	3.52
HS3	.404	7.02	.393	6.08
HS4	.270	4.67	.253	6.16
HS5	.704	12.11	.701	10.94
Correlation estimate e3 ↔ e4 = .168				

*critical ratio values > 1.96 indicate statistical significance (p < .05). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

Parameter estimates for the final HS model ranged from .25 to .82. Home satisfaction (HS1) had the highest path coefficient and was therefore considered the predominant variable that defined the HS construct with a coefficient of .82. Three of the five variables (HS1, HS2, and HS5) had estimates greater than .5, indicating good statistical performance of the model and an appropriately defined construct. The two remaining variables, HS3 and HS4, both had coefficients of .39 and .25 (respectively). Although these estimates were low, HS3 and HS4 were retained in the model because of their relevance to housing and to ensure an overidentified model. Low parameter estimates for HS3 and HS4 may suggest that external features of the home, such as the neighborhood the home resides in, may be relatively unimportant to overall housing satisfaction in older adults compared to the interior features of the home.

Socioeconomic Status (SES)

Typical measures used to gain insight on socioeconomic factors influencing health have included education, occupation, housing tenure, financial dependency on Social Security and family income (Grundy & Glaser, 2000; Lillie-Blanton & Laveist, 1996; Wolinsky & Johnson, 1992). Based on the literature and the available data, three observed variables were used to define the construct SES: income level, financial abilities, and educational attainment. Table 31 summarizes the variables used to define this construct.

Income level was determined using a 9 point scale. Subjects were asked to state their income including income from employment and spouse's employment, social security, and other retirement income such as income from investments, savings, rent,

Table 31: Descriptive Statistics for SES Construct

	SES1	SES2	SES3
Name of variable	Income level	Financial abilities	Education level
Type of measurement scale	Continuous	dichotomous †	Continuous
Range	1 - 9	0 = some, a lot of difficulty 1 = none or little difficulty	1 - 4
Mean or %	5.22	0 = 15.4% 1 = 84.6%	2.70
SD	2.43	-	.922
skewness	0.26	-	.263
Kurtosis	-1.15	-	-1.22

† indicates variable converted from ordinal to dichotomous

alimony, etc. To determine financial abilities, subjects were asked to state their level of difficulty in meeting monthly payments of bills. Response choices were based on a 4 point likert scale and therefore converted to dichotomous data. To determine educational level, subjects were asked to state the highest level of education completed. Responses were then categorized as completed 11^{th} grade or less, high school graduate, college graduate degree, graduate degree.

Validation of Measurement Model: Socioeconomic status (SES)

Figure 22 depicts the measurement model for SES. Similar to the RSpF construct, this latent variable only had three observed variables to define the construct. Therefore, equality constraints (var_b) were applied to SES1 and SES3 to ensure an over-identified model. GOF indices indicated a good fit between the hypothesized model and the sample (Table 32). All standardized parameter estimates were significant (Table 33). Therefore, no modifications were made to the model.

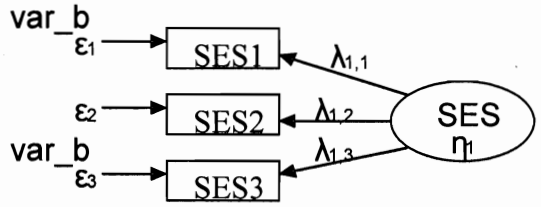


Figure 22: Measurement Model of SES

Table 32: GOF Indices for SES

Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
1. Equality constraints	.107 (p = .744)	1.00	.999	.000	1.000	1.021	12996

Table 33: Initial and Final Measurement Model for SES

	Initial model	
	Standardized Estimate	Critical Ratio*
SES1**	.948	
SES2	.241	4.46
SES3	.539	11.31

*critical ratio values > 1.96 indicate statistical significance (p < .05). A double asterisk (**) denotes parameter fixed to 1 for purposes of statistical identification

Parameter estimates for the final SES model ranged from .241 to .948. Two of the three variables used to define SES had factor loadings greater than .5 suggesting the construct was appropriately defined. Income (SES1) had the highest path coefficient and

was therefore considered to be the predominant factor defining the construct. This was followed by education level (SES3) and financial abilites (SES2).

Marital Status, Gender, Age

Marital status (MS), gender, and age were treated as individual observed variables. To determine marital status, subjects were asked if they were currently married, in a partnership, widowed, separately, divorced, or never been married. Responses were categorized into either married/partnered or not married/partnered. To determine age at time of interview, subjects were asked their date of birth. This was converted into age in years. A determination of gender was made by the interviewee during the time of interview. Descriptive statistics of these variables are shown in Table 34.

Table 34: Descriptive Statistics for Marital Status, Age, and Gender

Variable	Range	Mean or %	SD	Skew-ness	Kur-tosis
Marital status	0 = Not married/partnered	35.3%	-	-	-
	1 = Married/partnered	64.7%			
Age	60.01-103.20	73.6	7.21	.39	.05
Gender	0 = Male	39.1%	-	-	-
	1 = Female	60.9%			

Assumptions of Study

Below is a discussion of the assumptions of the study. An in-depth discussion of the study limitations are presented in Chapter 6.

Assumptions Regarding Subjects

The data is based on self-report. There is evidence to suggest that older adults often underreport and/or minimize the impact of their limitations and disabilities (Rubenstein, Schairer, Wieland, & Kane, 1984). This is particularly true in subjects who have diminished cognitive functioning (Karagiozis, Gray, Sacco, Shapiro, & Kawas, 1998). Further, some questions ask the subject to recall past status or use of past services. These recollections may be inaccurate based on intervening events and/or ability to recall events (Kane & Kane, 2000). Although subjects were screened for cognitive ability, it is assumed that subjects answered the questions truthfully and to the best of their ability.

Assumptions Regarding the Survey used in the Study

Some of the questions used in the survey were derived from previously developed multiple item scales that have known reliability. However, there are a few single-item questions, as well as multiple item scales used in the survey that have not been tested for reliability. It is assumed that these items have acceptable levels of reliability. In addition, variables used to measure some of the constructs were based on conceptualizations found in the literature. It was assumed that the variables used to measure these constructs accurately reflected the construct as it was defined. This latter assumption was further investigated through the use of confirmatory factor analysis.

Attributes of the interviewer have been shown to affect the responses given during a face-to-face interview (Streiner & Norman, 1995). It is assumed that biases of the interviewer did not affect the responses given by the subjects.

Assumptions Regarding Statistical Analysis

Structural equation modeling has two critical assumptions: the data are either continuous or dichotomous, and the data meet the requirements for normality. The single-item likert scales with more than four choices were treated as continuous data. In addition, any variables that were determined by summating and averaging several likert scales were treated as continuous data. With the exception of educational level, single-item likert scales with only four choices were converted to dichotomous data.

Summary of Methods

A second order measurement model for HRQL was developed and validated using confirmatory factor analysis. HRQL was initially defined by five constructs: general health perceptions, physical functioning, psychological functioning, social functioning, and vitality. Goodness-of-fit statistics for the initial model indicated an inadequate fit. To improve the model, several respecifications were made. Vitality was removed from the model due to the latent variable having a negative variance. Three indicators of social functioning were removed due to non-significant parameter estimates. Finally, four measurement errors were correlated. Goodness of fit indices of the final model indicated the sample fit the hypothesized model well.

A description and validation of the factors hypothesized to influence HRQL was presented. The full structural model, and results, are presented in Chapter 5.

CHAPTER 5

Results

Full Structural Model of Factors Influencing HRQL

The full structural model consists of three parts: the confirmed measurement model of HRQL, the confirmed measurement models of constructs hypothesized to influence HRQL, and the observed variables hypothesized to influence HRQL. The initial full structural model is depicted in Figure 23. Three latent constructs (MB, HS, SES) and four observed variables (MS, gender, age, RSpF3) are depicted as influencing HRQL. Single headed arrows pointing to HRQL represent regression paths, thus making HRQL an endogenous latent variable. Zeta (ζ) represents the error term associated with HRQL.

GOF statistics for the initial model (model 1) reveal less than adequate fit (Table 35). The predictors of HRQL explain 43.1% of the variance in HRQL. Parameter estimates (Table 36) indicate several non significant parameter estimates including the latent construct SES and each of the observed variables (MS, gender, age, RSpF3). These non significant variables were dropped from the model. In model 2 (Figure 24), constructs and variables with non-significant parameter estimates were dropped. Since the literature suggests a relationship between religion and HRQL, rather than completely eliminating religion/spirituality from the model, RSpF3 (importance of

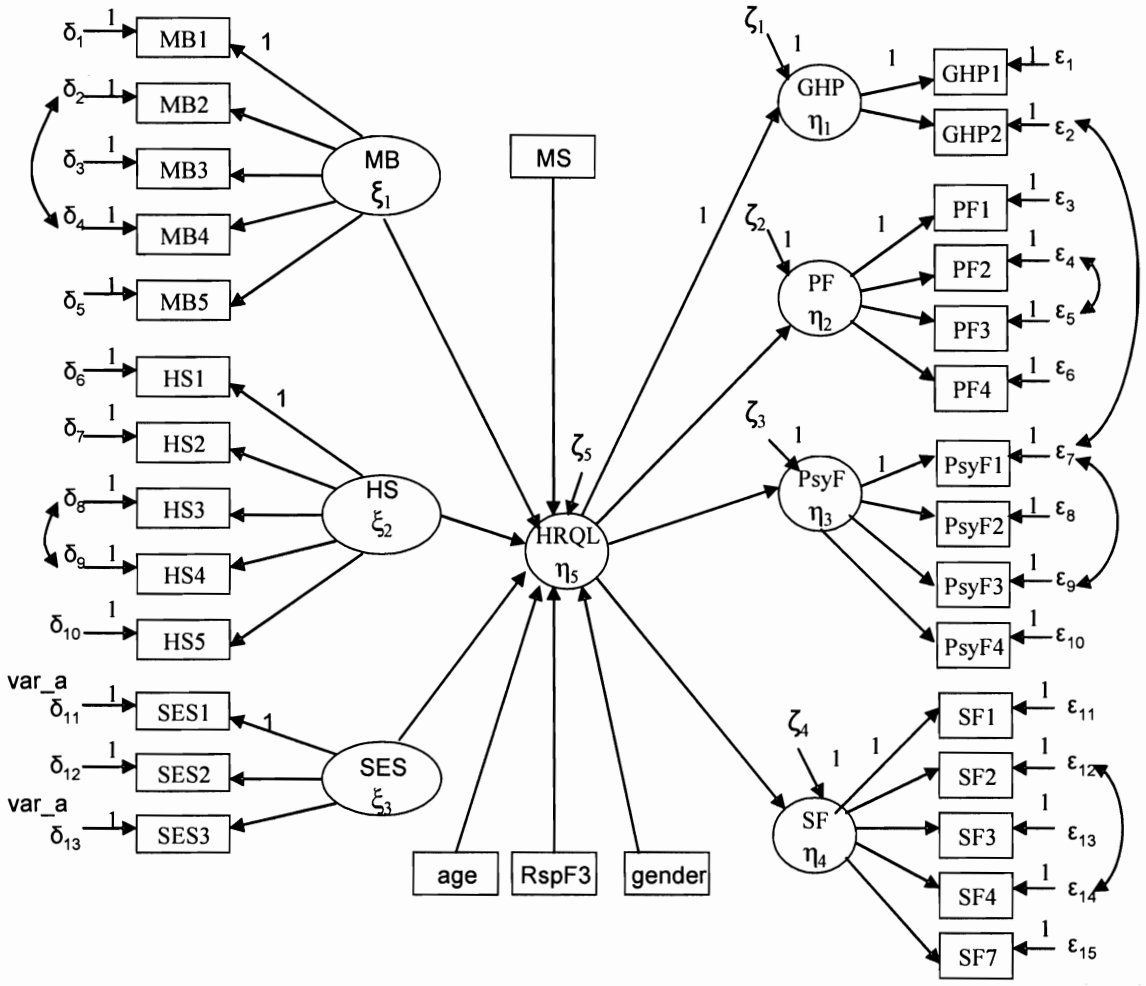


Figure 23: Initial Full Structural Model (model 1).
HRQL is represented as a second order model. Three factors are depicted as influencing HRQL: MB, HS, and SES. Four observed variable are depicted as influencing HRQL: age, gender, marital status, and RSpF3

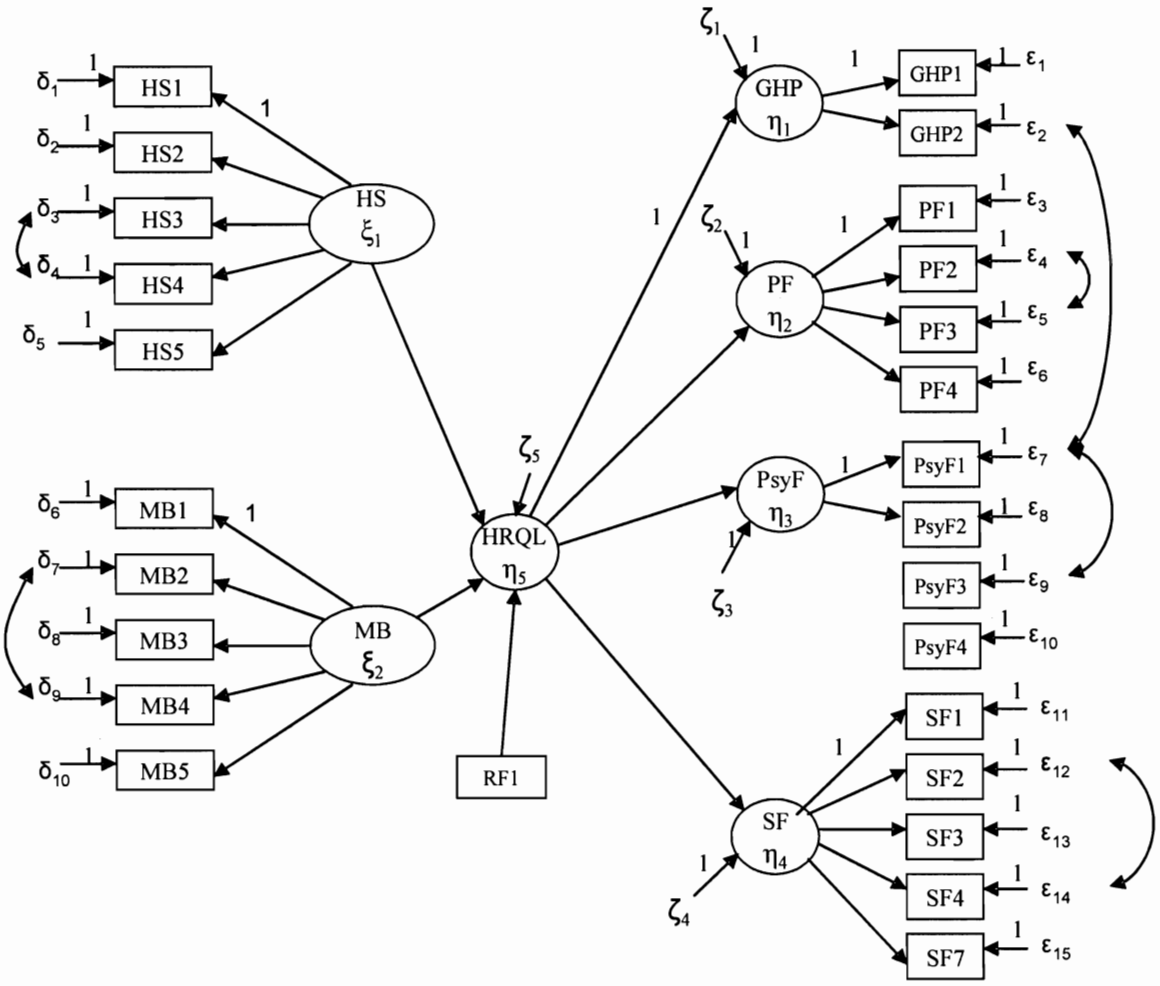


Figure 24: Final Full Structural Model.
HRQL is represented as a second order model. Two constructs are depicted as influencing HRQL: MB and HS. One observed variable, RF1, is depicted as influencing HRQL.

Table 35 : GOF Indices for Full Structural Model

	Model	χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
1.	initial	2.418 (p = .000)	.836	.808	.063	.821	.803	167
2.	SES, MS, age, gender removed; RSpF 3 replaced with RF1	2.039 (p = .000)	.892	.868	.054	.904	.891	203

Table 36: Parameter Estimates for Initial Full Structural Model*

	Estimate	Standardized error	Critical Ratio	Standardized estimate	P value
HS → HRQL	.875	.245	3.577	.211	.000
PWB → HRQL	-.598	.062	-9.660	-.617	.000
SES → HRQL	-.004	.044	-.102	-.006	.919
Age → HRQL	-.005	.011	-.475	-.025	.635
MS → HRQL	.160	.162	.989	.052	.323
Gender → HRQL	-.078	.159	-.494	-.026	.621
RSpF3 → HRQL	.169	.282	.600	.031	.549

*R^2 = .431

religion/spirituality) was replaced with RSpF1 (frequency of attendance at religious events). RSpF1 was chosen since frequency of attendance at religious events is a common variable used in instruments designed to measure religious practices. The label RSpF1 was changed to RF1 since the variable no longer measured spiritual functioning. GOF statistics from model 2 reveal an improved model fit and is considered the final model (Table 35).

Parameter estimates for the final model are presented in Table 37. All parameter estimates for factors influencing the second order model of HRQL are significant ($p < .05$). GOF indices (Table 35) indicate acceptable levels of fit for 3 out of the 6 indices (RMSEA, CFI, and CN). When the remaining 3 indices (GFI, AGFI, and TLI) are rounded to the nearest 10^{th}, all fall within acceptable levels. The predictors of HRQL in model 2 explain 44% of the variance of HRQL.

Table 37: Parameter Estimates for Final Full Structural Model*

	Estimate	Standardized error	Critical Ratio	Standardized estimate	P value
HS → HRQL	.897	.243	3.695	.216	<.001
MB → HRQL	-.592	.061	-9.683	-.610	<.001
RF1 → HRQL	.439	.156	2.810	.146	.005

*R^2 = .440

Hypotheses Results

Results of Hypothesis 1a

The first hypothesis stated that increased levels of medical burden (MB) will have a negative impact on HRQL. The parameter estimate for this construct was significant ($\beta = -.610$; $p < .001$) indicating increased levels of MB resulted in lower levels of HRQL.

Results of Hypothesis 1b

The second hypothesis stated that greater involvement in religious/spiritual functioning (RSpF) will have a positive impact on HRQL. Due to problems previously described with this construct, a single observed variable was used to represent RSpF. The original observed variable chosen to represent RSpF was RSpF3, a rating of how

important religious or spiritual beliefs were in daily life. This variable was chosen over the remaining two since it is less dependent on an individual's functional ability such as traveling in the community or visual impairments. RSpF3 was also considered a more global question since it considered an individual's spirituality. However, the regression weight for RSpF3 was not significant (p=.549). Therefore, RSpF1 (frequency of attendance at religious events) was used as a single observed variable to represent religious functioning. The variable label RspF1 was changed to RF1 to more accurately reflect the variable's measurement of religious functioning, and not religious/spiritual functioning. The parameter estimate for RF1 was significant (β =.146; p = .005), indicating that increased frequency of attendance at religious events was associated with higher levels of HRQL.

Results of Hypothesis 1c

The third hypothesis stated that higher levels of socioeconomic status (SES) will have a positive impact on HRQL. Analyses revealed a non-significant parameter estimate (β = -.006; p = .919) indicating that SES did not influence HRQL. SES was subsequently dropped from the final model.

Results of Hypothesis 1d

The fourth hypothesis stated that higher levels of satisfaction with housing (HS) will have a positive impact on HRQL. The critical ratio revealed statistical significance (β = .216; p < .001) indicating that greater levels of HS had a positive impact on HRQL.

Results of Hypothesis 1e

The fifth hypothesis stated that single older adults will have diminished levels of HRQL compared to married/partnered older adults. The analysis revealed a non-significant parameter estimate (β = .052; p=.323) indicating that marital status did not influence HRQL. This variable was subsequently dropped from the final model.

Results of Hypothesis 1f

The sixth hypothesis stated that increasing age will have a negative effect on HRQL. This hypothesis was not supported by the data (β = -.025; p = .635) and the variable was subsequently dropped from the final model.

Results of Hypothesis 1g

The final hypothesis stated that older adult women will have diminished levels of HRQL compared to older adult men. The analysis revealed a non-significant parameter estimate (β = -.026; p=.621) indicating that marital status did not influence HRQL. This variable was subsequently dropped from the final model.

Summary

A full structural equation model was tested examining factors influencing HRQL. Four constructs (MB, SES, HS, RSpF) and three observed variables (MS, age, gender) were hypothesized to influences HRQL. Of these four constructs, RSpF was dropped from the full structural model due to lack of observed variables needed to obtain an over-identified model. In lieu of this construct, a single observed variable, RF1 was used to determine the influence of attendance at religious events on HRQL. Of the seven paths hypothesized to influence HRQL, only three were found to have a significant effect on

HRQL: MB, HS, and RF1. SES, MS, age, and gender did not have a significant effect on HRQL. GOF indices revealed the final full structural model fit the data adequately. The exogenous variables used to predict HRQL explained 44% of the variance in HRQL.

CHAPTER 6

Discussion

This chapter begins by discussing the results for each hypothesis and comparing the findings to the existing literature. This follows with a discussion of the full structural model. Next, the limitations of the study are discussed. Lastly, conclusions, study implications, and recommendations for future research are provided.

Relationship between Medical Burden and HRQL

Brief Summary of MB Construct

Five observed variables were used to define the medical burden (MB) construct: number of chronic illnesses, out-of-pocket medical expenditures, number of overnight stays in a hospital or nursing home or respite care, number of times spoken with a health care provider, and number of prescribed medications taken. A descriptive summary of the variables used for this construct can be found in Chapter 4, Table 21.

MB1, the number of chronic illnesses, had the highest path coefficient ($\beta = .98$), and therefore was considered the predominant variable contributing to the construct. Only one other variable, MB5 (number of prescribed medications taken), demonstrated a factor loading greater than .5. The parameter estimates of the remaining observed variables ranged from .19 to .35.

Relationship between MB and HRQL

Despite limitations of the MB construct, the construct demonstrated a statistically significant link with HRQL. Specifically, increased levels of medical burden (MB) were associated with decrements in HRQL (β = -.610). Therefore, the hypothesis that there is an independent inverse association between medical burden and HRQL was supported. These results are consistent with previous literature that has examined the relationship between the individual variables used to define MB and HRQL. There were no studies found that used a multi-item measurement model of MB to examine its relationship with HRQL.

The average number of chronic illnesses found in this study (mean = 2.33; SD = 1.66) is similar to that reported in the literature. Although methodologies differed, Wolff et al (2002) reported an average of 2.34 chronic conditions per person in a national representative study of adults aged 65 and over enrolled in Medicare Part A and B. The number of chronic conditions was identified by a health care provider using the International Classification of Disease, ninth revision, Clinical Modification (ICD-9-CM). This is in contrast to self-report used in the current study.

Several studies have found that multiple chronic health problems are significantly associated with reduced levels of HRQL. This relationship holds true across all age groups (Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Michelson, Bolund, & Brandberg, 2001; Stewart et al., 1989) as well as studies examining older populations (Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Hellstrom & Hallberg, 2001; Kempen, Brilman, Ranchor, &

Ormel, 1999). For example, Guallar-Castillon et al (2005) studied subjects 57 years and older living in the Netherlands. They found a significant association between number of self-reported chronic medical problems and HRQL (using the SF-36) after controlling for sociodemographics such as age, sex, and educational level.

Although number of medications taken (MB5) had a significant role in defining MB ($\beta = .78$), the literature examining the relationship between number of medications taken and HRQL is limited. The mean number of medications reported in this study was 1.51 (SD = 1.23). This is generally lower than that reported in the literature. For example, Hershman, Simonoff, Frishman, Paston & Aronson (1995) reported an average of 2.3 (SD = 1.8) prescription drugs taken in community based older adults aged 75 to 85. In another study by Hanlon et al (1992), the average number of prescription drugs taken was reported as 2.35 in community residents aged 65 and older. However, in the current study and in previous studies, it is possible that subjects misreported the number of medications taken based on the interpretation of the question. For example, subjects may have included non-prescription drugs (e.g.: over-the-counter drugs, herbs, vitamins) as "prescribed" medications, making the reported number of medications higher. Despite the limitations of self-report data, literature suggests that increased use of medication is associated with decreased ratings of components of HRQL. Hershman et al (1995) found that community based elders who consumed less prescription medication (mean = 1.9; SD = 1.6) rated their perceived health as either excellent or good; those who were prescribed more medication (mean = 2.8; SD = 1.8) were more likely to rate their perceived health as fair or poor. There were no studies found that looked at the influence

of number of medications taken and HRQL in the community dwelling older adult using an HRQL instrument. However, in a sample of patients with COPD, as the number of medications taken increased, scores on several components of the SF-36 decreased (Esteban, Moraza, Quintana, Aburto, & Capelastegui, 2005).

Health care resource utilization variables (MB2, MB3 and MB4) were found to have lower, yet significant parameter estimates ($\beta = .19$; $\beta = .34$: $\beta = .35$, respectively) in defining MB. The relationship between increased overnights spent in a health care facility (MB3), and increased number of times spoken with a health care provider (MB4) and decrements in HRQL is in agreement with the available literature. Ethgen et al (2002) found that increased number of office visits with health care providers and increased number of inpatient stays and emergency room visits was associated with decreases in HRQL in patients with osteoarthritis and rheumatoid arthritis. The study used several HRQL instruments, including the SF-36, and controlled for confounding variables such as age, sex, marital status, and comorbidities.

Although out of pocket medical expenditures (MB2) contributed significantly to the MB construct, the parameter estimate ($\beta = .19$) indicated that this variable did not make a major contribution to the construct. The low parameter estimate may partially be explained by the reduction of this variable from continuous to dichotomous data in order to meet the assumptions of normality. There was no literature found examining the relationship between out-of-pocket expenses and HRQL. However, there is literature to support a relationship between increased out-of-pocket medical expenditures and higher education level and income level (Hong & Kim, 2000). Therefore, out-of-pocket

expenses may be better represented by a single observed endogenous variable influenced by socioeconomic status. Additionally, the majority of subjects in this study (74%) had out-of-pocket medical expenditures ≤ $1200/year. According to studies, this represents the lower end of out-of-pocket medical expenses (Crystal, Johnson, Harman, Sambamoorthi, & Kumar, 2000; Goldman & Zissimopoulos, 2003; Harman, Kelleher, Reynolds, & Pincus, 2004; Langa et al., 2004; Stewart, 2000) for older adults. This lower than average number may have been a result of the wording of the Pathways question: "What is the total amount of your out-of-pocket medical expenditures in the last year?" Since the question did not operationalize out-of-pocket expenditures, it is unclear whether some subjects included health insurance premiums in the estimation of total out-of-pocket expenditures. Inclusion or exclusion of health care premiums could have made a large difference in reported out-of-pocket expenses. In a study by Crystal et al (2000), the majority of out-of-pocket medical expenditures in beneficiaries 65 years and older was spent on insurance premium payments. Levit et al (1998) recommends the inclusion of premiums when estimating out-of-pocket expenses since studies have indicated that premiums are becoming a significant part of out-of-pocket expenses.

The present study appears to be unique in that it is the first to develop and utilize a construct of MB rather than a single indicator to determine the influence of MB on HRQL. The strength of this approach is that it does not rely on a single variable to measure or define a multidimensional construct. Of the five variables used to define the MB construct, only two of those variables exhibited coefficients that were strongly associated with the medical burden construct. It is conceivable that a stronger

performance in the MB measurement model may have resulted in an even stronger association between MB and HRQL. Because of the uniqueness of this study, comparisons of the findings in this study to the literature were made by discussing the relationship between each of the observed variables used to measure MB and HRQL. Consistent with the literature, higher levels of MB were associated with lower levels of HRQL.

Relationship between Religion/Spiritual Functioning and HRQL

Brief Summary of RSpF Construct

Religious/spiritual functioning (RSpF) was defined by three observed variables: frequency of attendance at religious events, frequency of watching religious services on television, and importance of religious or spiritual beliefs. A descriptive summary of these variables can be found in Chapter 4, Table 25.

Confirmatory factor analysis of the RSpF construct indicated that the three variables did not represent one construct. Because the three variables did not represent one construct, a single variable was chosen from the three observed variables to determine if a relationship existed between religion/spirituality and HRQL.

Relationship between RSpF1, RSpF3 and HRQL

Initially, the single observed variable analyzed in the full structural model was RSpF3, the rating of importance of religious and spiritual beliefs in daily life. RSpF3 was chosen over RSpF1 (frequency of attendance at religious services) because it did not rely on subjects mobility and/or ability to travel and was thought to better represent the construct of both religious and spiritual functioning. However, RSpF3 did not have a

significant influence on HRQL. When RSpF1 (relabeled RF1 in the final model) was treated as a single observed variable influencing HRQL, increased attendance at religious services was significantly associated with increased levels of HRQL ($\beta = .245$). Therefore, an independent positive association between attendance at religious services and HRQL was supported.

The lack of a significant relationship between RSpF3 and HRQL was unexpected. These findings are inconsistent with the majority of literature that supports a positive relationship between religious/spiritual beliefs, and HRQL or components of HRQL. One possible explanation for this inconsistency may have been related to the measurement scale used. RSpF3 was originally measured on an ordinal scale. Since the scale had only four categories, it was transformed into a dichotomous variable. This resulted in 8.3% of subjects stating that religion and spirituality were not important to them and 91.7% of subjects stating that religion and spirituality were at least a little important to them. Very uneven splits between categories found in this study may have led to problems with the multivariate analysis (Tabachnick & Fidell, 1996). Another possible explanation for the lack of relationship between RSpF3 and HRQL may be related to the phrasing of the question used in the Pathways survey. The Pathways survey asked subjects to rate the degree of importance of religious or spiritual beliefs in every day life. However, this question may not have necessarily reflected the subjects actual religious or spiritual functioning. Attitudinal measures of religious or spiritual functioning (e.g.: importance of religion) may be less important to HRQL than

behavioral measures of religious or spiritual functioning (i.e.: frequency of attendance at religious events).

Comparison of the current study to the literature is difficult because of the differences in how religion and spirituality are conceptualized. Challenges exit in operationally defining both religiosity and spirituality. In particular, spirituality has been poorly defined. This has led researchers to consider religiosity and spirituality as a single concept (Egbert, Mickley, & Coeling, 2004; Mueller, Plevak, & Rummans, 2001), as it was in the current study, while others have treated the terms as two separate constructs (Daaleman, Kuckelman Cobb, & Frey, 2001).

In studies that have only considered spirituality, increased levels of spiritual well-being have been associated with a positive impact on HRQL or components of HRQL (Bussing, Ostermann, & Matthiessen, 2005; Kirby, Coleman, & Daley, 2004). According to a review article by Mueller et al (2001), the association between spiritual well-being and HRQL has been found for various patient populations including persons with cancer, HIV, heart disease, spinal cord injury, and limb amputation.

There are inconsistencies in the literature that examines the relationship between religion/spirituality, combined, and components of HRQL. In a review article by Cohen & Koenig (2003), of the 24 cross-sectional studies examining the effect of religion and spirituality on mental health, 17 of these studies showed a positive relationship, while seven studies showed no relationship. The measurement of religiosity and spirituality varied considerably in these studies, ranging from single item questions (hours/week of church participation), to multi-item measurement tools. For example, in a study by

Daaleman et al (2004), using community dwelling adults aged 65 years and older, spirituality (six item scale) was an independent predictor of self-rated health status (single item measure). However, religiosity (five item scale), was not significantly associated with self-rated health. In a prospective study with community dwelling adults aged 65 and older, frequency of attendance at religious services was associated with higher levels of functional ability (15 item scale) (Idler & Kasl, 1997b).

While the literature supports the positive relationship between religious involvement and better physical and mental health (Koenig, McCullough, & Larson, 2001; McFadden, 1995), the current study appears to be the first to demonstrate a direct relationship between frequency of religious attendance and HRQL. In a related study, using the SF-36 in a population aged 65 and over, frequency of prayer was related to mental health, but not to physical health (Meisenhelder & Chandler, 2002).

Although the influence of religious involvement on HRQL was significant, the parameter estimate was low ($\beta = .245$), suggesting that increases in religious involvement had a small effect on HRQL. Several reasons may account for this weak relationship. First, most researchers contend that religiosity and spirituality are multidimensional constructs with overlapping dimensions (Egbert, Mickley, & Coeling, 2004). The use of a single observed variable limited the definition of the construct. For example, attendance at religious events, used in this study, is only a measurement of public religious practices (Meisenhelder & Chandler, 2002). It is also possible that the relationship between the measure of attendance at religious events and HRQL reflects the positive aspects of socializing. The same benefits may be derived from belonging to

other social clubs. The Fetzer institute and the National Institute on Aging have developed nine other domains to measure the religious/spiritual construct including religious affiliation, personal religious/spiritual history, private religious practices, social support, religious coping, beliefs and values, commitment, forgiveness, and daily spiritual experience (Idler et al., 2003). On the other hand, Idler and Kasl (1997b) argue that attendance at religious events is a multidimensional measurement in that it encompasses several dimensions including the psychological experience of worship and the social support aspects of religious attendance. However, literature has shown that attendance at religious events tends to decline starting at age 70 (Ploch & Hastings, 1994). Thus, the single variable may not have captured the religious beliefs of many of the individuals in the sample used for the current study.

In summary, confirmatory factor analysis did not validate the original proposed religious/spiritual functioning construct. Rather than eliminating the construct, a single observed variable, RSpF3 (importance of religious/spiritual beliefs) was chosen to represent the construct. In contrast to the literature, this observed variable did not have a significant parameter estimate. Alternatively, RSpF1 (attendance at religious events) was used in the final model to represent religious functioning (labeled RF1 in the final model). RF1 was significantly associated with HRQL. However, attendance at religious events may only capture a small segment of the older population and many not be truly representative of the degree of religiousness of individuals.

Relationship between Housing Satisfaction and HRQL

Brief Summary of HS Construct

Satisfaction with housing was defined by five observed variables: overall satisfaction with the living unit, satisfaction with the degree of privacy, neighborhood satisfaction, overall residential satisfaction, and satisfaction with the interior of the home. A descriptive summary of the variables used for this construct can be found in Chapter 4, Table 28.

Each of the observed variables had significant factors loadings ranging from .25 to .82. Among those with the highest loadings included satisfaction with the interior of the home (HS5), overall satisfaction with the living unit (HS1) and satisfaction with the degree of privacy (HS2), indicating that these observed variables had the greatest influence in defining the HS construct.

Relationship between HS and HRQL

This study demonstrated a positive association between the degree of housing satisfaction and HRQL. That is, as satisfaction with housing increased, HRQL increased ($\beta = .216$). Therefore, the hypothesis that there is an independent positive association between satisfaction with housing and HRQL was supported. These results are consistent with the literature which suggests that housing quality may be important to the overall well-being of older adults (Balfour & Kaplan, 2002; Eshelman, Evans, & Utamura, 2003). To date, the majority of studies have examined housing in terms of the structural quality of the housing. This study appears to be unique in that it developed a construct of housing satisfaction that offered a more complete description of the residential

experience including perceptions regarding the neighborhood, privacy, and appearance of the home.

No studies were found that examined the relationship between a multivariate construct of housing satisfaction and HRQL. However, studies have examined relationships between single variable measures related to housing satisfaction and components of HRQL. Therefore, comparisons of the findings in this study to the literature can only be made by discussing the relationship between the observed variables used in this study to components of HRQL.

The two issues related to housing that have been the most frequently studied include the physical features of the home and the neighborhood in which the home is located. In the current study, physical features of the home (HS5) were measured by asking subjects if they were satisfied with the space in their home. Although there are no studies that have looked at the relationship between satisfaction with physical features and HRQL, studies have found a positive relationship between the quality of physical features of the home and dimensions of HRQL. For example, Evans et al (2002), using the Pathways data set, examined the relationship between housing quality and psychological well being in community dwelling older adults. Housing quality, measured by a 45 item scale examining interior features of the home (by a trained examiner), was associated with improved levels of psychological well-being after controlling for demographic variables.

The impact of the neighborhood on dimensions of HRQL has been studied and the findings from the literature are in agreement with the findings from the current study.

Steptoe and Feldman (2001) found that subjects self-rating of neighborhood problems, such as traffic, safety concerns, and access to public transportation, were associated with poor self-rated health and psychological well-being in subjects aged 18 to 94 living in London. Literature has also suggested a relationship between the neighborhood and physical functioning. Researchers have found that poorer quality neighborhoods are associated with worse physical functioning in both older adults and the general population after controlling for health and SES (Balfour & Kaplan, 2002; Feldman & Steptoe, 2004).

Only one study was found that examined the impact of privacy on dimensions of HRQL. Evans et al (2000) assessed housing quality using six subscales, one of which included subject's reports of privacy. Using a low and middle income sample, better quality housing (in which privacy was judged to be higher) was related to lower levels of psychological distress in women who had at least one child living at home.

The current study found a positive relationship between HS and HRQL. Although the HS construct performed well as a model, the inclusion of additional variables may have enhanced the relationship between HS and HRQL. For example, the scale used to assess the interior features of the home primarily measured satisfaction with space. It did not address issues of structural quality or potential hazards and therefore is limited in its representation of the interior of the home. Additionally, researchers have suggested broadening the scope of the residential experience by assessing a variety of design principles. Examples include social interactions, aesthetics/appearance, condition of building and utility systems, and adaptability (Christensen, Carp, Cranze, & Wiley,

1992; Regnier, 1994; Zhu & Shelton, 1996). Secondly, the use of self-reported measures in this study may have resulted in subjects who were highly satisfied with their housing environment, even though their housing environment may have had significant deficiencies (Zhu & Shelton, 1996). Therefore, assessment of the residence and immediate neighborhood by trained raters may give a more accurate depiction of the quality of housing as compared to self-report of housing satisfaction used in the current study. Despite construct limitations, a positive association was found between HS and HRQL. Improvements in defining the construct will further elucidate the relationship between these variables.

Relationship between SES and HRQL

Brief Summary of SES Construct

Three observed variables were used to define socioeconomic status: income level, financial abilities, and education level. A descriptive summary of the variables used for this construct can be found in Chapter 4, Table 31.

Income (SES1) had the highest path coefficient ($\beta = .948$) and was therefore considered the most important variable contributing to the construct. This was followed by education level ($\beta = .539$) and financial abilities ($\beta = .241$).

Relationship between SES and HRQL

The results of this study indicated that SES has no significant independent influence on HRQL. Therefore, the hypothesis that higher levels of SES would have a positive impact on HRQL was not supported. This construct was subsequently dropped from the final model.

The finding of no significant relationship between SES and HRQL is in contrast to most of the literature. However, there were no studies found that used a multi-item construct, as was used in the current study, to define SES. The most common indicator of SES used in the literature has been single item variables measuring either household income, occupation, or education level. For example, in a study of the Japanese population aged 16 years and older, annual household income was strongly associated with higher scores on all eight dimensions of the SF-36 scores in men after adjusting for demographic variables such as age, district of residency, education, comorbidities, marital status and occupation (Yamazaki, Fukuhara, & Suzukamo, 2005). Among women, only two dimensions of the SF-36 (general health perception and social functioning) were weakly associated with annual household income. Arber et al (1999), using a univariate analysis, found an association between income level and self-assessed health in individuals 60 years and over living in Great Britain.

Among those studies that used education level as a proxy for SES, most had a positive association between the number of years of education and aspects of HRQL. This was found in studies using both a univariate and multivariate approach. For example, in an Asian sample aged 21 to 65 years of age, years of education was associated with the physical function, role-emotional, and mental health scales of the SF-36 (Thumboo et al., 2003). Similar results were reported by Kempen et al (1999) in a group of individuals aged 57 and over from the Netherlands. In contrast to these studies, Wan et al (1999) found no significant effect of education level on HRQL in Hispanic and African Americans with cancer aged 17 years and over.

No studies were found that examined the relationship between SES and HRQL in older American community dwelling adults using a multivariate approach. It is possible that the relationship between SES and HRQL differ between countries and cultures. Additionally, Duncan et al (2002) have suggested that the traditional marker of SES, namely household income, may not be an adequate proxy for SES in retired older adults because it does not reflect available financial resources. This is in agreement with Lynch and Kaplan (2000) who have suggested that income is a less sensitive measure of SES in older adults. This notion has been confirmed in several studies. Matthews et al (2005) measured financial abilities by first asking individuals their income and then asking subjects "Do you find this adequate or is it difficult to manage on that income?" They found that a measure of financial difficulty explained the greatest amount of variance in prevalence and onset of disability in adults aged 75 years and over compared to other socioeconomic indicators such as total income, housing tenure, and social class based on occupation. In a study by Cheng et al (2002), economic condition was measured by a single item question asking older adults to rate how sufficiently they were able to cover daily expenses. Self-rated economic condition was significantly associated with self-rated health after controlling for sociodemographic variables in a sample of individuals 65 years and over residing in public housing in Hong Kong. Similarly, in a study by Peek et al (2005), older adults were asked to assess how much difficulty they had meeting monthly payments on bills. Increases in financial insufficiency were associated with reduced functional and mental health.

Since the literature indicates that financial abilities may be a more appropriate proxy for SES in older adults, an a posteriori analysis was performed to determine if any of the observed variables used to define SES had a significant influence on HRQL in the full multivariate model. Three separate full structural models were analyzed, each with a different SES variable. Parameter estimates for each of the revised final models are presented in Table 38. Examination of parameter estimates for the revised final model indicated that the only observed variable from the SES construct found to independently influence HRQL was financial abilities (SES2), a measure of the difficulty meeting monthly payments on bills. Specifically, greater ease in meeting monthly payments was

Table 38: Parameter Estimates for Revised Models*

Revised Model with SES1	Estimate	Standardized error	Critical Ratio	Standardized estimate	P value
MB → HRQL	-.589	.061	-9.629	-.611	<.001
HS→ HRQL	.888	.242	3.669	.215	<.001
RF1 → HRQL	.442	.156	2.835	.148	.005
SES1 → HRQL	.015	.032	.460	.024	.645
Revised Model with SES2**					
MB → HRQL	-.579	.060	-9.607	-.605	<.001
HS→ HRQL	.837	.238	3.524	.205	<.001
RF1 → HRQL	.444	.154	2.887	.149	.004
SES2 → HRQL	.671	.211	3.188	.165	.001
Revised Model with SES3					
MB → HRQL	-.594	.061	-9.710	-.611	<.001
HS→ HRQL	.900	.243	3.704	.216	<.001
RF1 → HRQL	.441	.156	2.823	.146	.005
SES3 → HRQL	-.015	.084	-.183	-.009	.855

*critical ratio values > 1.96 indicate statistical significance ($p < .05$).
**$R^2 = .459$

associated with improvements in HRQL. This revised final model is presented in Figure 25. GOF indices for the revised final model that included SES2 indicated an acceptable level of fit (Table 39). The predictors of HRQL in the revised final model which included SES2 explained 46% of the variance in HRQL, as compared to 44% of explained variance for the model without SES2.

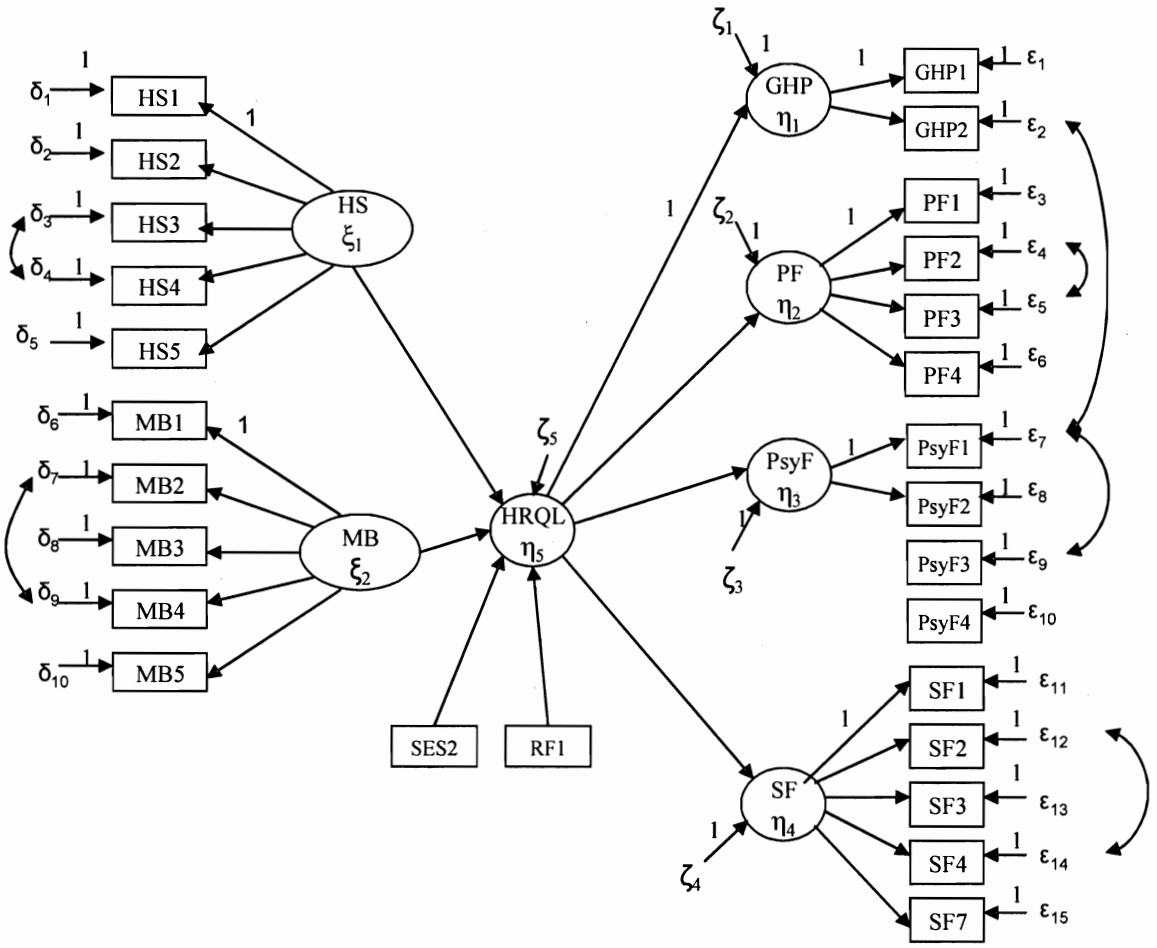


Figure 25: Revised Full Structural Model.
HRQL is represented as a second order model. Two constructs are depicted as influencing HRQL: MB and HS. Two observed variables, SES2 and RF1, are depicted as influencing HRQL.

Table 39: GOF Indices for Revised Full Structural Model

χ^2/df	GFI	AGFI	RMSEA	CFI	TLI	CN
2.065 (p = .000)	.882	.858	.054	.887	.874	199

In summary, the SES construct did not significantly influence HRQL. This is in contrast to most of the literature. However, literature suggests, and the current study confirms, that the ability to adequately meet monthly financial obligations may be a more important proxy for SES compared to more traditional measures of SES such as income and education level. Increases in financial abilites were independently associated with increases in HRQL.

Relationship between Age and HRQL

Age was treated as a single observed variable in the initial model. A descriptive summary of this variable can be found in Chapter 4, Table 34. The results of this study suggest that age does not influence HRQL. Therefore, the hypothesis that increasing age would have a negative impact on HRQL was not supported. Age was subsequently dropped from the final model.

Studies looking at normative values using the SF-36 have shown a relationship between physical functioning and age as well as mental health and age. Specifically, decrements in physical functioning have been associated with advancing age (Hopman et al., 2000; Lopez-Garcia et al., 2003; Mishra & Schofield, 1998), while most studies have shown increases in mental health to be associated with advancing age (Loge & Kaasa, 1998; Mishra & Schofield, 1998). Similar findings have been reported using the EORTC

QLQ, a common European HRQL instrument (Michelson, Bolund, Nilsson, & Brandberg, 2000). However, these studies were based on univariate analyses and the independent impact of age on HRQL is not clear. Only one study was found that used a multivariate analysis to determine the effect of age on HRQL. Wolinsky (2004) found that demographic variables including age contributed very little to each SF-36 scale, explaining only 1-5% of the total variance in HRQL in a sample of middle-aged African Americans.

There is evidence to suggest that the effect of age on HRQL may be mediated through chronic health problems. Studies have shown that regardless of age group, those subjects reporting one or more chronic health problems have lower levels of HRQL compared to those reporting no chronic health problems (Greimel, Padilla, & Grant, 1997; Michelson, Bolund, & Brandberg, 2001). This suggests that declining HRQL may be related to increases in number of comorbidities rather than differences in age. To test this in the current study, an a posteriori analysis was performed by depicting a path going from age to medical burden (MB) in the revised final full structural model (Figure 26). Parameter estimates for the revised model with the addition of age revealed a significant positive association between age and MB (Table 40). As expected, there was no change in goodness of fit indices or R-squared value compared to the revised model. These results indicate that in adults aged 60 and over, age indirectly influences HRQL through its relationship with MB. Specifically, increasing age is associated with increasing levels of MB, which has a negative impact on HRQL. Age, however, does not have a direct influence on HRQL.

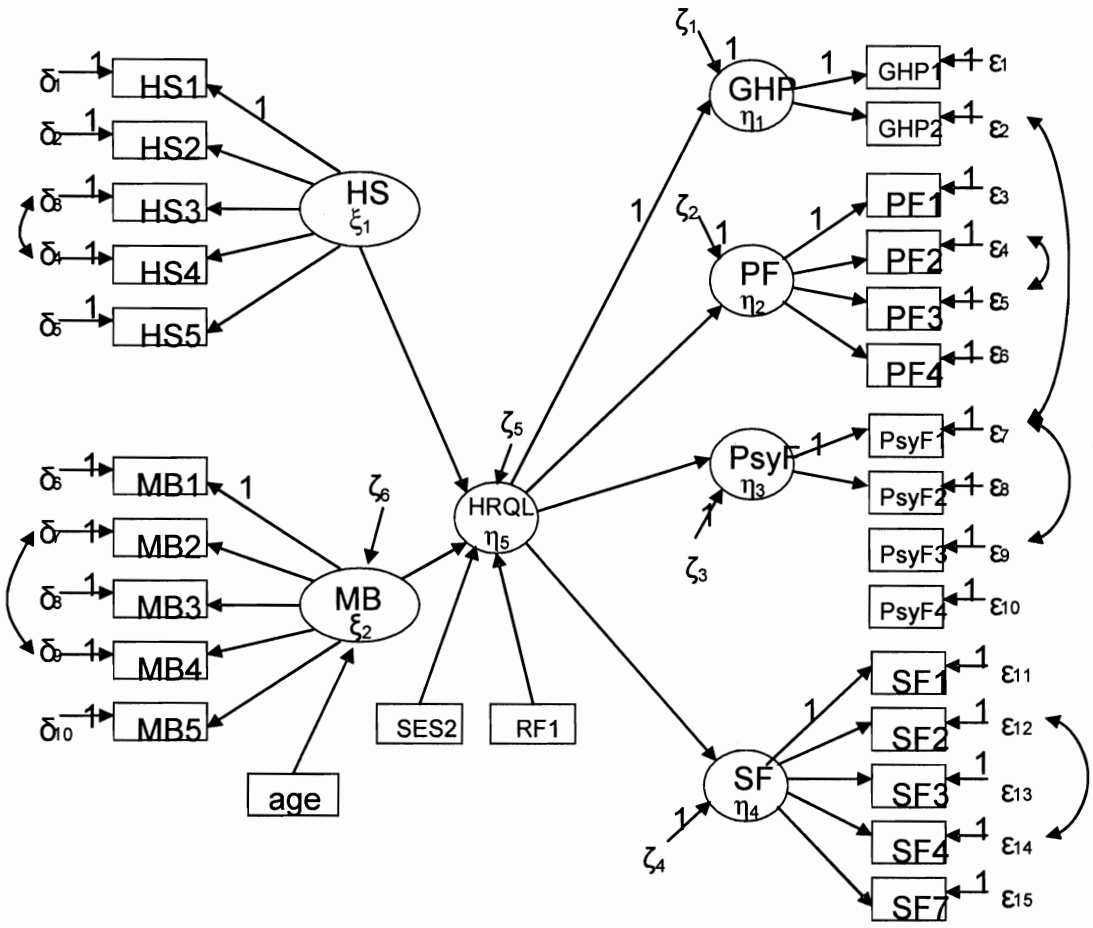


Figure 26: Revised Full Structural Model with Addition of Age.

Table 40: Parameter Estimates for Revised Final Full Structural Model with Addition of Age*

	Estimate	Standardized error	Critical Ratio**	Standardized estimate	P value
HS → HRQL	.835	.237	3.519	.205	<.001
MB → HRQL	-.578	.060	-9.633	-.606	<.001
RF1 → HRQL	.447	.153	2.913	.151	.004
SES2 → HRQL	.675	.210	3.519	.166	<.001
Age → MB	.029	.012	2.502	.138	.012
GOF indices					
χ^2/df	2.065				
GFI	.882				
AGFI	.858				
RMSEA	.054				
CFI	.887				
TLI	.874				
CN	199				

*R^2 = .46.
*Critical ratio values > 1.96 indicate statistical significance ($p < .05$).

Relationship between Gender and HRQL

Gender was depicted as a single observed variable in the initial model. A descriptive summary of this variable can be found in Chapter 4, Table 34. Results indicate that gender does not have a significant influence on HRQL. Therefore, the hypothesis that older adult women would have diminished levels of HRQL compared to men was not supported. This variable was subsequently removed from the final model. hypothesis that older adult women would have diminished levels of HRQL compared to men was not supported. This variable was subsequently removed from the final model.

Most literature has shown women to have decreased levels of HRQL compared to men. This has been found in the older adult population as well as younger age groups, in multiple countries, and utilizing different HRQL instruments (Guallar-Castillon, Sendino, Banegas, Lopez-Garcia, & Rodriguez-Artalejo, 2005; Hemingway, Nicholson, Stafford, Roberts, & Marmot, 1997; Hopman et al., 2000; Michelson, Bolund, Nilsson, & Brandberg, 2000; Sprangers et al., 2000; Ware, 1993).

Contrary to the above findings, studies have also found no significant differences in health status between men and women. For example, in a study by Blake et al (2000), no significant differences were found in HRQL, as measured by the SF-36, in a random sample of the Irish population aged 18 years and over. Similar findings were reported by Michelson et al (2001) using the EORTC QLQ-C30 in the Swedish population aged 18-79 years of age. However, much like age, the impact of gender in the studies found did not simultaneously control for other intervening variables. Therefore, the independent impact of gender on HRQL is unclear from the literature.

Studies suggest that lower levels of HRQL in women compared to men may be related to health conditions. Studies have shown that women tend to report a greater number of health problems compared to men (Borglin, Jakobsson, Edberg, & Hallberg, 2005). This suggests that differences in HRQL due to gender may be mediated by medical burden (MB). However, in an a posteriori analysis in the current study, no significant path existed between gender and MB ($\beta = .032$, $p = .564$). Therefore, the results of the current study indicate that gender does not independently influence HRQL or medical burden in community dwelling older adults.

Relationship between Marital Status and HRQL

Marital status was depicted as a single observed variable. A descriptive summary of this variable can be found in Chapter 4, Table 34. Results indicate that marital status has no influence on HRQL. Therefore, the hypothesis that there is an independent association between marital status and HRQL was not supported. It appears that single older adults do not have diminished levels of HRQL compared to married/partnered older adults. Marital status was subsequently removed from the final model.

Studies have shown that subjects who are married or who live with a partner rate HRQL higher than subjects who are single or live alone (Loge & Kaasa, 1998; Michelson, Bolund, Nilsson, & Brandberg, 2000; Prause et al., 2005; Sprangers et al., 2000). However, much like age and gender, these studies used a univariate statistical approach and did not determine whether MS had an independent effect on HRQL. In a study by Wolinksy et al (2004) using a multivariate approach, demographics, including marital status, only accounted for 1-5% of the variability in HRQL. The authors concluded that marital status, along with age and gender, had a minimal effect on HRQL in middle-aged African Americans. No multivariate studies were found that examined the influence of marital status on HRQL in community dwelling older adults. The current study indicates that MS has no direct influence on HRQL in community dwelling older adults.

Final Structural Model

The findings that medical burden, housing satisfaction, and attendance at religious events were associated with HRQL are consistent with the proposed model which is

based on conceptual frameworks of the disablement model. For example, Wilson and Cleary (1995), conceptualized nonmedical factors (e.g: economic, political, cultural and spiritual) as directly influencing overall quality of life (Figure 10). In the current study, housing satisfaction and religious functioning represented non-medical factors that had a significant direct influence on HRQL. The association between medical burden and HRQL found in the current study is consistent with the model presented in *The Guide to Physical Therapist Practice* (2001), depicting the influence of comorbidities, medical care, and medication use on the disablement process (Figure 12).

In the revised full structural model (Figure 26), the medical burden construct explained the majority of the variance in HRQL (37%), while the remaining constructs and variables contributed less than 10% of the total variance in HRQL. One explanation for these findings is the impact each of these constructs and variables have on the different components of HRQL. In the present study, the HRQL construct was defined by four lower order constructs: general health perception, physical functioning, psychological functioning, and social functioning. Literature has not only shown a strong negative effect of medical burden on physical functioning (Stewart et al., 1989; Verbrugge & Patrick, 1995), but has also shown that medical burden has an adverse effect on general health perceptions, psychological functioning, and social functioning (Kempen, Jelicic, & Ormel, 1997; Michelson, Bolund, & Brandberg, 2001). Housing, on the other hand, has only been shown in the elderly population to have an impact on psychological and physical functioning (Balfour & Kaplan, 2002; Evans, Kantrowitz, & Eshelman, 2002). Similarly, the effect of religion and spirituality in the elderly has shown a relationship with only psychological and physical functioning (Idler & Kasl,

1997b; Kirby, Coleman, & Daley, 2004; Meisenhelder & Chandler, 2002). Therefore, the impact of medical burden on HRQL may be greater than the impact of housing satisfication and attendance at religious events on HRQL because medical burden is associated with all aspects of HRQL, while housing satisfaction and attendance at religious events only impacts two of the four constructs used to define HRQL.

The SES construct did not have a direct effect on HRQL. This is inconsistent with the proposed model as well as conceptual models in the literature. For example, in the HRQL model presented by Patrick (1997), the economic system and prosperity is depicted as directly influencing HRQL. In a post-hoc analysis, when a single observed variable (SES2; financial abilities) was used as a proxy for SES in the full multivariate model, there was a significant direct effect on HRQL. Neither income nor education level had a direct influence on HRQL. The finding that financial abilities was the only single observed variable to independently influence HRQL is consistent with the literature that suggests more typical measures of SES in the older adult, such as income, may not be an appropriate proxy for SES.

Age, gender, and marital status did not have a significant direct effect on HRQL, suggesting that these variables do not have a direct independent influence HRQL. This finding is inconsistent with the proposed model and conceptualization in the literature. However, in an a posteriori analysis, an indirect effect of age on HRQL was mediated through the medical burden construct.

The final full structural model (Figure 24) explained 44% of the variance in HRQL. With the addition of a single indicator for SES (Figure 25), 46% of the variance in HRQL was explained. Other factors that have been suggested to influence HRQL

include insurance status (Wan et al., 1999), race/ethnicity (Wan et al., 1999), and performance based measures of impairment (Peek, Patel, & Ottenbacher, 2005). The influence of race and ethnicity on HRQL was not considered in the current study since 98% of the subjects in the Pathways data identified themselves as Caucasian. Impairment or performance-based data was not available since the Pathways study only used self-reported data.

Study Limitations

Sample

This study relies on data from a randomly selected sample of community-dwelling older adults living in Tompkins County, New York. Tompkins County is considered a rural community located in central New York with a population of approximately 97,000 (United States Census Bureau, 2000). In an unpublished study comparing the demographics of the Pathways study sample to the 1990 Tompkins County census for individuals 60 and older, an excellent level of comparability was observed (Henderson & Oggins, 1999). This was seen in the examination of age distribution, race, sex, marital status, and income, providing evidence of the representativeness of the study sample. However, it is unlikely that the study sample is representative of all community dwelling elderly individuals in the United States. Particularly noteworthy in this study sample is the skewed data with regard to race and educational level. Ninety-eight percent of the sample identified themselves as caucasion, while thirty-two percent of the sample held a graduate degree. Educational attainment was likely to be higher in the study sample, as Tompkins County is home to a large university (Cornell University) and a

mid-sized college (Ithaca College). Therefore, the model should be cross-validated for different elderly populations.

While the sample used in this study represented a random sample, the sample was comprised of a fairly homogenous group of highly functioning individuals. One explanation for this finding is that higher functioning individuals are more likely to be living independently in the community, while lower functioning individuals are more likely to be living in residential care facilities. Consequently, it may be difficult to capture a wide range of functioning levels in the community dwelling older adult. Additionally, a sample with a wider range of functioning would have produced a wider range of values, resulting in different model performance results. Therefore, caution is warranted when generalizing the results of this study to lower functioning community dwelling older adults.

Study Design

The model depicted in this study used arrows denoting causal pathways of constructs and observed variables influencing HRQL. While the study demonstrates a causal effect, the unidirectional arrows only establish a recursive or unidirectional pathway. Therefore, this study did not establish whether HRQL influences medical burden, attendance at religious events, housing satisfaction, and financial abilities.

Development of Constructs

While the use of the Pathways data set offered several advantages, a secondary data set diminished the control the researcher had over the variables collected and development of constructs. In some cases, this resulted in a more narrowly defined

construct than conceptualized in the literature. Although several of the constructs were validated using confirmatory factor analysis, the addition of other variables might have improved the properties of the construct. Further, the reliability of several of the variables used in the development of the constructs was not known. For example, the medical burden construct relied on the individual's ability to recall specific events (eg: number of medications taking, number of times spoken with health care provider, out-of-pocket medical expenditures) over a one to two year period. Reliability of some of the medical burden measurements may have been improved by verifying the information with medical records.

Degree of religiousness and spiritually were considered a single construct in this study. Therefore, in those individuals stating that religiousness and spirituality were important to their daily life (RSpF3), one was unable to distinguish whether the individual was referring only to the importance of religiousness, only to the importance of spirituality, or a combination of both. The single observed variable, frequency of attendance at religious services (RSpF1), while significantly influencing HRQL, only measured a narrow aspect of religious functioning. Other observed variables that are not dependent on function should be incorporated in the development of a religious functioning construct such as those suggested by the National Institute of Aging. These include religious affiliation, personal religious history, private religious practices, religious commitment, and beliefs and values (Idler et al., 2003). Further, the influence of spirituality on HRQL was not established in this study. A separate spirituality construct will need to be utilized to determine its independent influence on HRQL.

Suggested measures of spiritual well-being have included ones spiritual well-being and daily spiritual experiences (Olson & Kane, 2000).

The housing construct was limited to an individual's perception of housing satisfaction. Deficiencies in actual quality of housing were not measured in this study. It is conceivable that an individual may have rated satisfaction high when significant housing deficiencies existed. Assessment of housing and the immediate neighborhood by trained raters may have given a more accurate depiction of quality of housing rather than relying on self report of housing satisfaction. In addition, the construct should be further broadened to assess a wide range of housing design principles including the accessibility and function of the housing, adaptability of the home, opportunities for social interaction in and out of the home, as well as issues regarding safety and security (Christensen, Carp, Cranze, & Wiley, 1992; Regnier, 1994).

The SES construct relied on three indicators, which may not have been enough to capture the multiple dimensions of the construct. Braveman et al (2005) suggests the use of less commonly used measures of SES including neighborhood socioeconomic conditions and past socioeconomic experiences.

Finally, an established HRQL instrument was not used in the Pathways study. Therefore, a model of HRQL was developed for this study primarily based on the dimensions captured in the SF-36 and other HRQL instruments. Confirmatory factor analysis was used to determine the extent to which the observed variables were linked to their underlying latent constructs. This allowed for testing the validity of the HRQL measurement model. However, not all scales used in the development of the constructs

were tested for their psychometric properties. Therefore, the reliability of several of the observed variables used to define the first order constructs was not known.

Measurement Scales

Some of the observed variables used to define constructs did not meet the assumptions of normality and were subsequently converted to dichotomous dichotomous data. This results in a substantial reduction in the ability to differentiate small differences between subjects.

Conclusions and Study Implications

HRQL instruments are commonly used to measure outcomes in health care. Typical constructs used to define and measure HRQL include physical, psychological, and social functioning. This study demonstrates that there are other constructs and variables particularly salient in older community dwelling adults that directly influence HRQL. These variables and constructs should be accounted for when conducting randomized clinical trials and cohort studies examining HRQL outcomes in older community dwelling adults.

Of all the constructs tested in this study, medical burden explains the largest amount of variance and has the greatest influence on HRQL. With census data projecting dramatic increases in the older population, as well as increases in the number of older individuals living with chronic conditions, this construct is particularly important to consider and control for when studying HRQL. Although previous studies considered single item variables to measure medical burden, this study appears to be the first to

develop a multiple item construct. The advantage of this approach is that one does not need to rely on a single measure of a multidimensional construct.

Higher levels of housing satisfaction are associated with improved levels of HRQL. Despite the strong performance of HS as a measurement model, the construct explains only a small amount of variance in HRQL (4%). One possible explanation for this finding is that housing satisfaction may not be as important to HRQL as is housing quality. Development of a housing quality construct, including observation of housing quality by trained raters, both in the residence and in the immediate neighborhood, may further elucidate the role of housing on HRQL. The growing desire for elders to live at home for as long as possible makes this construct particularly important and should be accounted for in HRQL studies using older adults.

Although increased attendance at religious events is significantly associated with improved levels of HRQL, this variable does not represent the construct depicted in the initial model. While attendance at religious events does explain a small amount of variance in HRQL (2%), the variable only captures a single dimension of religiousness. Similar to housing satisfaction, the Pathways study did not provide sufficient tools to adequately develop this construct. It is possible that with a multidimensional construct, a greater amount of variance will be explained. The influence of spirituality is unclear from this study since the single variable used to measure spirituality was not utilized in the final model. A multidimensional construct capturing spirituality will be necessary to determine its role in HRQL. Religion and spirituality appear to be important to many

older adults. Based on the results of this study, frequency of attendance at religious events should be accounted for when studying HRQL in older adults.

In an a posteriori analysis, the level of difficulty in meeting monthly payments was the only socioeconomic variable to influence HRQL. This may indicate that financial abilities are a more sensitive marker of socioeconomic status in the older population compared to more traditional measures such as household income and educational level. Therefore, financial abilities should be taken into consideration when examining HRQL outcomes in older adults.

Other demographic variables including gender, marital status and age do not have a direct effect on HRQL. Age, however, indirectly influences HRQL through its association with medical burden. Therefore, HRQL, as it was conceptualized in the current study, does not appear to be sensitive to gender and marital status and do not need to be accounted for when measuring HRQL in the elderly. Age, on the other hand, does have a direct influence on MB, but does not independently influence HRQL. These findings are particularly relevant, as these variables are not amenable to change. Therefore, interventions used to improve HRQL do not appear to be dependent on unmodifiable demographic variables influencing HRQL.

Areas for Future Research

This study provided an initial framework for studying influences on HRQL. However, the two constructs (housing satisfaction and medical burden) and the two observed variables (frequency of attendance at religious services and financial abilities) only explained 46% of the variance in HRQL. Therefore further studies are warranted to

explore other factors that may help in explaining additional variance. The literature suggests that race/ethnicity (Wan et al., 1999), insurance status (Wan et al., 1999), and the number of discretionary activities an individual is involved with may influence HRQL (Jenkins, Pienta, & Horgas, 2002). Discretionary activities refer to leisure and social activities that older adults typically participate in. Examples of discretionary activities include reading, watching television, hobbies, socializing with friends, and participation in recreational activities. In addition, further exploration of the marital status variable is warranted. In the current study, marital status was dichotomized into married/partnered or single. Although this dichotomized variable did not influence HRQL in the current study, additional aspects of living arrangements need to be explored. For example, subjects may not have been married or partnered, but may have lived with children, grandchildren, or friends, which may have influenced HRQL. Therefore, the issue may not be marital status but rather the difference between living alone versus a living situation including at least one other person.

Aside from further development of the constructs influencing HRQL (discussed in the limitations section), the use of a well established HRQL instrument with known psychometric properties is recommended. The reliability and validity of the SF-36 are well established and creates two separate summary scores for dimensions of physical and mental health, as well as sub scores for eight multi-item variables. Use of the SF-36 would allow for examination of pathways to these dimensions and aid in guiding HRQL intervention studies. Further, the social functioning construct used in the current study to define HRQL had a very low factor loading and therefore may not be important in

defining HRQL. This is in agreement with studies by Reed (1998) and Wan (2002) who suggest that social functioning is not represented by its own construct in the SF-36. However, social functioning as a construct influencing HRQL should be explored. Additionally, it is possible that the relationship between frequency of attendance at religious events and HRQL reflects the positive aspects of socializing. Since attendance at religious events explains such a small proportion of the variance in HRQL, if this variable is used as a single observed variable, consideration of including frequency of attendance at religious services as part of the social functioning construct should be investigated.

Lastly, the oldest age group, generally considered those individuals 85 years and over, have not been studied extensively and were underrepresented in this study (6% of the sample were 85 years and older). Since this age group is expected to grow to over 14 million individuals by the year 2040, influences on HRQL in this age group should be considered, as they may differ from influences on individuals less than 85 years of age.

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Appendix A

Pathways Survey Questions

1. Are you married, in a partnership, widowed, separated, divorced, or have you never been married? (MS)
   1. married 2. widowed 3. separated
   4. divorced 5. never been married 6. partnership

a. If married or partnered, how many years have you been in the relationship?

11a. How often do you attend religious services? (RSpF1)
   1. holidays 2. once a month
   3. twice a month 4. once a week or more

11c. How often do you watch religious services on TV? (RSpF2)
   1. holidays 2. once a month
   3. twice a month 4. once a week or more

12. In general, how important would you say religious or spiritual beliefs are in your daily life? Would you say very important, moderately important, a little, or not at all? (RSpF3)

4. very important	3. moderately important	2. a little important	1. not at all important

13. Do you currently do any volunteer work in the community or (for facility residents) at your residence? (SF7)
   1. Yes → b. About how many hours per month do you volunteer? _____

16. Are you currently working for pay? (SF8)
1. Yes 0. No
↓
b. About how many hours do you work for pay per week?

24. [BOOKLET] Please rate your life at the present time on a scale of 1 to 10, with *1 being the worst possible life you can imagine* and *10 being the best possible life you can imagine.* (PsyF4)

Worst life possible Best life possible

1 5 10

25. During the past 30 days, how much of the time have you felt the following: (PsyF1)

		none	little	some	most	all time
a.	Cheerful	1	2	3	4	5
b.	In good spirits	1	2	3	4	5
e.	Extremely happy	1	2	3	4	5
g.	Satisfied	1	2	3	4	5
h.	Full of life	1	2	3	4	5
k.	Calm and peaceful	1	2	3	4	5
c.	So sad nothing could cheer you up	1	2	3	4	5
d.	Nervous	1	2	3	4	5
f.	Restless of fidgety	1	2	3	4	5
i.	Hopeless	1	2	3	4	5
j.	That everything was an effort	1	2	3	4	5
l.	Worthless	1	2	3	4	5

28. [BOOKLET] Please indicate whether you *strongly agree, agree, disagree*, or *strongly disagree* with each of the following statements: (PsyF2)

		SA	A	D	SD
c.	I feel that I do not have any close personal relationships with other people.	4	3	2	1
g.	I have close relationships that provide me with a sense of emotional security and well-being	4	3	2	1
k.	I feel a strong emotional bond with at least one other person.	4	3	2	1
n.	I lack a feeling of intimacy with another person.	4	3	2	1

e.	There are people who enjoy the same social activities as I do	4	3	2	1
a.	I feel part of a group of people who share my attitudes and beliefs.	4	3	2	1
o.	There is no one who likes to do the things I do.	4	3	2	1
b.	There are people I can depend on to help me if I really need it.	4	3	2	1
f.	If something went wrong, no one would come to my assistance.	4	3	2	1
l.	There is no one I can depend on for aid if I really need it.	4	3	2	1
p.	There are people I can count on in an emergency.	4	3	2	1
d.	There is no one I can turn to for guidance in times of stress	4	3	2	1
h.	There is someone I could talk to about important decisions in my life.	4	3	2	1
j.	There is a trustworthy person I could turn to for advice if I were having problems.	4	3	2	1
m.	There is no one with whom I feel comfortable talking about problems.	4	3	2	1

29. Do family or friends ever help you in any of the following ways? (SF5)

		If Needed	Yes	No
a.	When you are sick?	2	1	0
b.	Shop or run errands for you?	2	1	0
c.	Give you gifts (presents)?	2	1	0
d.	Help you out with money?	2	1	0
e.	Fix things around your house?	2	1	0
f.	Keep house for you or do household chores	2	1	0
g.	Give you advice on business or financial matters?	2	1	0
h.	Provide transportation for you?	2	1	0
i.	Prepare or provide meals for you?	2	1	0

30. Do you ever help family or friends in any of the following ways? (SF6)

		If Needed	Yes	No
a.	When they are sick?	2	1	0
b.	Shop or run errands for them?	2	1	0
c.	Give them gifts (presents)	2	1	0
d.	Help them out with money?	2	1	0
e.	Fix things around their house	2	1	0
f.	Keep house for them or do household chores?	2	1	0

g.	Give them advice on business or financial matters?	2	1	0
h.	Provide transportation for them?	2	1	0
i.	Prepare or provide meals for them?	2	1	0

31. Please indicate how strongly you agree or disagree with each of the following statements: (PsyF3)

a. Some people wander aimlessly through life, but I am not one of them.

1. Strongly Disagree	2. Disagree Somewhat	3. Disagree a little	4. Don't know	5. Agree a little	6. Agree Somewhat	7. Strongly Agree

b. I live life one day at a time and don't really think about the future.

1. Strongly Disagree	2 Disagree Somewhat	3 Disagree a little	4. Don't know	5. Agree a little	6. Agree Somewhat	7. Strongly Agree

c. I sometimes feel as if I've done all there is to do in life.

1. Strongly Disagree	2. Disagree Somewhat	3. Disagree a little	4. Don't know	5. Agree a little	6. Agree Somewhat	7. Strongly Agree

42. [BOOKLET] Pleas tell me if you *strongly agree, agree, disagree*, or *strongly disagree* with the following statements about your home. (HS1, HS2)

		SA	A	D	SD
e.	This is a comfortable living unit.	4	3	2	1
f.	I do not like living here.	4	3	2	1
g.	This place is close to my ideal living environment	4	3	2	1
h.	This is a pleasant living unit.	4	3	2	1
a.	In general, I have as much privacy as I want here.	4	3	2	1
b.	I have a place I consider to be my own here.	4	3	2	1
c.	I often must interact with people when I would prefer not to here.	4	3	2	1
d.	It is easy to find a quiet spot somewhere here.	4	3	2	1

51. [BOOKLET] Pleas tell me if you *strongly agree, agree, disagree*, or *strongly disagree* with the following statements: (HS 8)

		SA	A	D	SD
b.	In my home, I find it easy to find space to arrange valued possessions that have personal meaning, such as books, artwork and furniture.	4	3	2	1

c.	I am satisfied with the places for displaying personal possessions, such as shelves and wall surfaces.	4	3	2	1
d.	Personal objects and displays are lit in a way that allows me to see them well.	4	3	2	1
f.	My home has adequate storage.	4	3	2	1
g.	The space in my home is adequate for cooking.	4	3	2	1
h.	The space in my home is adequate for socializing.	4	3	2	1
i.	The space in my home is adequate for bathing.	4	3	2	1
j.	The space in my home is adequate for sleeping.	4	3	2	1

61. [BOOKLET] On a scale of 0 to 100, with *0 being the least satisfied* and *100 being the most satisfied*, how satisfied are you with getting what you pay for at your residence? (HS5)

Least satisfied most satisfied
0%----------100%

70. [BOOKLET] Next are some questions about our satisfaction with the neighborhood you live in. (HS3)

		VD	D	S	VS
a.	Location near friends	1	2	3	4
b.	Location near relatives	1	2	3	4
c.	Easy access to shopping	1	2	3	4
d.	Location near (off-site) medical services	1	2	3	4
e.	Location near a park or pleasant outdoor space	1	2	3	4
f.	Availability of public transportation	1	2	3	4
g.	Location in a safe, crime-free neighborhood	1	2	3	4
h.	Location near downtown Ithaca	1	2	3	4

80. How often do you currently exercise (number of times per week)? (PF4)
0. No _____ times per week

How often do you do each exercise (# days/week)
1.
2.
3.
4.
5.

81. Compared to other women/men of your age, would you say your health is *excellent, good, fair,* or *poor*? (GHP2)

1. poor	2. fair	3. good	4. excellent

82. [BOOKLET] Which step on the ladder indicates how your health has been lately? (GHP1)

10	
9	←— very best health
8	
7	
6	
5	
4	
3	
2	
1	
0	←— very serious health problems

85. On a typical night, how well do you sleep? *very well, fairly well, not very well, or poorly.*(VT1)

4. very well	3. fairly well	2. not very well	1. poorly

88. [BOOKLET] Which step on the ladder indicates how much pep or energy you have lately? (VT2)

10	
9	←— always full of pep
8	
7	
6	
5	
4	
3	
2	
1	
0	←— never have any pep or energy

94. In the past two years, have you been diagnosed with a new illness or had a serious injury? (MB1)

1. Yes 0. No

↓

a. What illness(es)/injury?

a1._____
a2._____
a3._____
a4._____
a5._____

b. In what month and year did each problem/trouble start/happen?

b1._____
b2._____
b3._____
b4._____
b5._____

c. Have you recovered from the illness/injury?			d. If yes, when did you recover?	
c1.	1. Yes	0. No	d1._____	mo/year
c2.	1. Yes	0. No	d2._____	mo/year
c3.	1. Yes	0. No	d3._____	mo/year
c4.	1. Yes	0. No	d4._____	mo/year
c5	1. Yes	0. No	d5._____	mo/year

95. Do you have any other health problems? (MB1)
1. Yes 0. No
↓

a. What are they?

_____
_____
_____
_____

Notes: _____
_____

b. Did any of these get worse in the past 2 years?
1. Yes 0. No
↓

c. If yes, when did they worsen?
c1._____mo/yr _____illness*
c2._____mo/yr _____illness
c3._____mo/yr _____illness
c4._____mo/yr _____illness
c5._____mo/yr _____illness

*use codes from 94a

96. Are you now taking any prescribed medication? (MB5)
1. Yes 0. No

↓

a. What is the medication for?

_____
_____
_____
_____
_____

Notes: _____
_____

99. The following items are activities you might do during a typical day. *Does your health now limit* you in these activities? (circle one number on each line) (PF1)

		YES, A LOT	YES, A LITTLE	NO, NOT AT ALL
a.	Vigorous activities such as running, lifting heaving objects, participating in strenuous sports?	1	2	3
b.	Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf?	1	2	3
c.	Lifting or carrying groceries	1	2	3
d.	Climbing one flight of stairs	1	2	3
e.	Walking uphill or climbing a few flights of stairs	1	2	3
f.	Bending, lifting, or stooping	1	2	3
g.	Walking one block	1	2	3
h.	Walking several blocks	1	2	3
i.	Walking one mile	1	2	3
j.	Eating, dressing, bathing, or using the toilet	1	2	3

101. When you travel around your community, does someone have to assist you because of your health? (PF3)

1. Yes All the time	2. Yes, Most of the time	3. Yes, Sometimes	4. Yes, Occasionally	5. No Never

102. Are you in bed or in a chair most of all of the day because of your health? (PF2)

1. Yes Everyday	2. Yes, Most days	3. Yes, Some days	4. Yes, Occasionally	5. No Never

104. In the past year, how many times have you talked to:
a. a doctor or a nurse about your health? (MB4)
_____# times

115. What is the total amount of your out-of-pocket medical expenditures in the last year? (MB2)
_____

116. During the past 2 years, have you stayed in the hospital overnight or longer? (MB3)
1. Yes 0. No
↓
c. What was the reason? _____

119. During the past 2 years, have you stayed in a nursing home or hospital respite care bed overnight or longer (for Longview residents, ask about the adult home)? (MB3)
1. Yes 0. No
↓
c. What was the reason? _____

139. [BOOKLET] Here is a list of income categories. Which category best describes your total household income? Household income includes your and your spouse's employment income, Social Security, and other retirement income such as income from investments, savings, rent, alimony, etc. (SES1)

9. $100,000 or more
8. $75,000 - $99,999
7. $60,000 - $74,999
6. $50,000 - $59,999
5. $40,000 - $49,999
4. $30,000 - $39,999
3. $20,000 - $29,999
2. $15,000 - $19,999
1. below $15,000

141. How much difficulty do you have in meeting monthly payments on your bills? no difficulty, not very much difficulty, some difficulty, or a lot of difficulty? (SES2)

1. no difficulty	1. not very much difficulty	3. some difficulty	4. a lot of difficulty

147. What is your birth date? (AGE) _____
month day year

Gender (GENDER): 0. Male 1. Female

148. What is the highest level of education you have completed? (SES3)
_____

Vita

Hilary Beth Greenberger was born in Brooklyn, New York. She completed her Bachelor of Arts at Oberlin College, in Oberlin Ohio in 1981 and her Master of Science in Physical Education from Dalhousie University, Halifax, Nova Scotia in 1983. In 1989, she received her Bachelor of Science degree in Physical Therapy from Ithaca College in Ithaca, New York. She is board certified in Orthopaedic Physical Therapy and has been practicing Physical Therapy since 1989. Presently, Hilary is an Associate Professor in the Department of Physical Therapy at Ithaca College.